73 Amateur Radio Today

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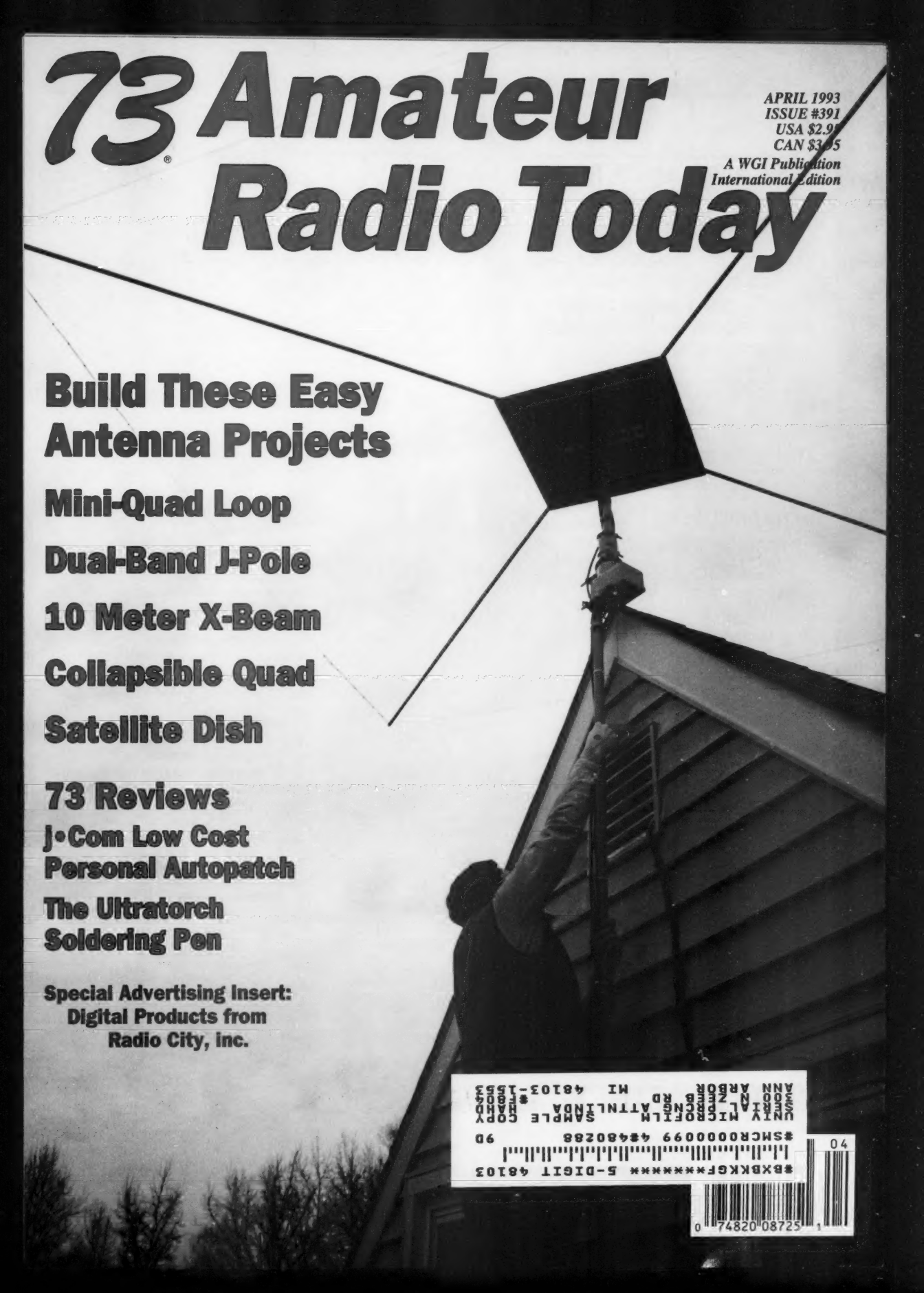

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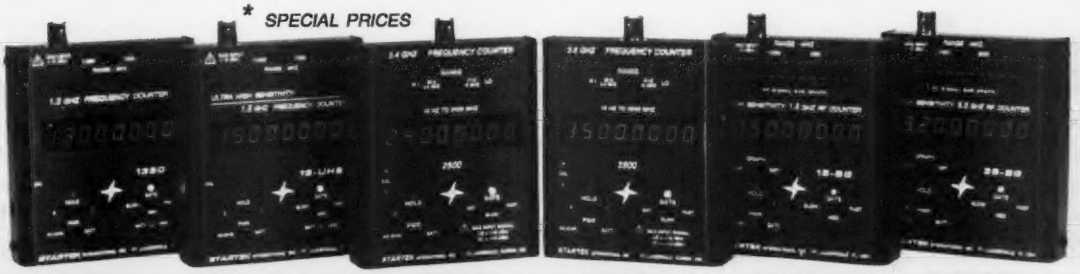

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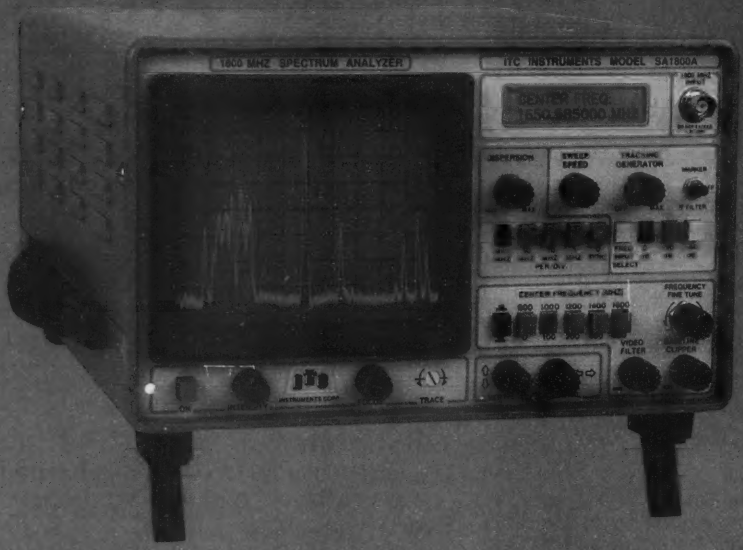

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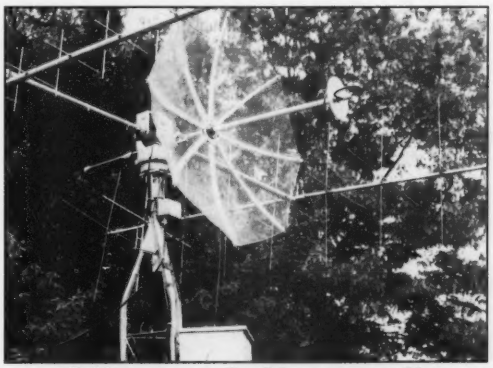

Build your own satellite dish . . . see page 30.

Cover: You can build this 10 meter X-beam. See page 18. Photo by John E. Williams N5SJZ.

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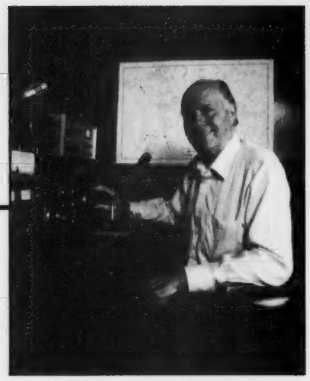
Contract: By casting your baby-blues on this miniscule type, you have just entered into a legal and binding agreement with the staff and management of *73 Amateur Radio Today* to do something nice for a newcomer to ham radio. The nicest thing you could do would be to spend a measely $12.97 and buy them a subscription to *Radio Fun*. That will help them get the most out of their new hobby.

NEVER SAY DIE

Wayne Green W2NSD/1



Radio Fun

Once it was clear that the no-code license was finally going to get by ARRL's stone wall, it looked as if we'd be seeing some growth in our hobby at last. That suggested three options, as far as publishing *73* was concerned. The information needs of newcomers are quite different from those of the older timers, so it would be difficult to make one magazine fit these contrary needs. Option one would be to ignore the newcomers and continue *73* unchanged. Option two would be to split it, trying to serve both groups of readers the way *QST* is doing. Option three was to go for option one and start a completely new publication totally dedicated to the needs of newcomers.

I chose option three.

To keep costs down I opted for tabloid format instead of the *73* size. This new size made use of newer typesetting systems, lower-cost presses, and much lower cost paper stock. You've probably noticed that most new publications are going for the tabloid format. I also like the flexibility of page designs the larger page provides, plus the ability to provide advertisers with more space to tell their sales story without having to charge them more.

Radio Fun was started a year and a half ago and has not just survived, despite a serious business recession, it's thrived. The reader feedback has been most gratifying. I suppose the one thing that has surprised us more than anything else is the number of older hams who are subscribing. The publication is aimed at helping newcomers not just get going in our hobby, but to discover the fantastic number of activities we have available. We mean the *fun* part, so we urge newcomers to try satellite communications, packet, RTTY, slow-scan, and so on. We want to help them get involved with club activities, to participate in contests, to get their higher-grade licenses and find out about working DX . . . perhaps even go on some DXpeditions! We want them to try traffic handling, working aurora skip, and experiment on our microwave bands. What we don't want is for them to get bogged down into a deep rut and lose interest.

There are antennas to erect, kits to build, new bands to explore, new equipment to buy and enjoy. There are flea markets, hamfests and conventions. There's even Dayton! And our newcomers need all the hand-holding they can get to help them discover all of the wonderful things we have in store for them. How many transmitter hunts have you participated in? I guarantee you'll never forget one single hunt you get involved with. It's like going on a DXpedition . . . I've operated from a bunch of rare countries and I don't think one minute of those experiences will ever be forgotten. Navassa (twice!), Jordan, Afghanistan, Iran, Nepal, Syria, Swaziland, Lesotho, New Caledonia, Fiji, Western Samoa, American Samoa, Wake Island, St. Pierre, Thailand, Korea, South Yemen . . . oh what a flood of memories! How about moonbounce? Too difficult, eh? Not for hundreds of hams around the world.

Since about 75% of all ham equipment sales are to newcomers, the advertisers in *Radio Fun* have been cleaning up. Many tell us that they are getting far more sales via their ads in *Radio Fun* than in *QST*! And that makes sense when you see the readership statistics. Every ham newcomer gets *Radio Fun*, while only a small percentage of the newcomers are subscribing to *QST*. As a publisher, I love to see our ad sales steadily increasing. Does that mean I'll be buying a company jet? Nope, it just means that the publication will be thicker and have more articles on fun things to do and how to do them.

It also means that we need more people to help us turn out two publications instead of one, so we're interviewing for help with technical editing, advertising sales, circulation management, and all the other chores involved. We're putting *Radio Fun* out on a Macintosh desktop publishing system, which is easy to learn and fun to use. I don't know of anything we're doing where a college degree would be of much help, though an ability to read and write does come in handy. If they had a college course on meeting deadlines I might respect colleges more. But don't get me started on our lousy American educational system!

Radio Fun, like *73*, is written largely by the readers. It's intended to be a communications more than an entertainment medium. If your club licenses a bunch of new hams, we want to publish a picture so we can spark more clubs into doing the same. We have far too many stick-in-the-mud clubs that need to be woken up. If you design a new piece of gear you can encourage others to duplicate your effort, as well as protect your idea, and perhaps even attract a manufacturer or kit supplier by writing it up. If you get involved with a new aspect of the hobby, such as satellite communication, keep notes of your successes and disasters and write it up. You'll help others to avoid the pitfalls, and perhaps inspire a few more hams to get involved.

If you buy a new piece of commercial ham gear and think others should know how much fun you're having with it, write it up. If you come up with some modifications or find some accessories, let us all know what you've done.

I don't know about you, but I don't trust most of the equipment reviews I read in the other ham magazines. They don't tell me the things I want to know . . . like what's new and different about this unit . . . what fun I am going to have with it . . . how difficult it is to get going. Things like that. I want to know how it does in the average hamshack, not at the hands of some professional writer who has more of an interest in pleasing the manufacturer than in leveling with me.

What's great about it? What's not so hot? How easy was it to set up and use? How does it compare with what you were using before? Make sense?The no-code ticket has doubled the number of newcomers, and if you can get your club to spread the word in your area we might be able to double that again. Some clubs are doing a fantastic job of recruiting newcomers. And contrary to the nabobs of negativism, these newcomers are busy learning the code so they can upgrade. The only bright side when it comes to our abundance of grouchy old-timers is that this attitude suppresses their immune systems and at least earns them their ``Silent Key'' award earlier than if they were fired with enthusiasm to try new things and help newcomers.

If you're not getting *Radio Fun* yet, foresooth! You can repair this serious oversight on your part by calling 800-257-2346, credit card in hand, and getting rid of a crummy $12.97 for a whole year of fun.

About Perot

He says he's looking for good ideas. Well, my book has a ton of them, many of which have been covered in my editorials down through the years. The problem is, how can we get H. Ross to read the book? Yes, of course I sent him a copy, but there's no sign that it ever got through to him. He's worried about the deficit. Fine, I proposed a whole new approach to solving this. He's concerned about our educational system and is looking for ideas for fixing it . . . which I've got. I propose a creative way to cut the cost of crime by about 80%, our health care costs even more than that, government expenses by 50% in five years, and so on. If you get a copy of my book, I think you'll be as excited as those who have already read it.

But how can we get through to Ross? He seems to be as insulated from the public he wants to work for as the President. Yes, I have a sneaky plan, but I need your help: Yes, *you*.

If you'll check out the bind-in cards in this issue you'll find one addressed to H. Ross. Tear it out, stamp it, and let's inundate him with cards. That oughta get his attention. Please note that I've left room for you to add a message of your own. Tell him what you think is the most important problem he should tackle . . . or perhaps force Clinton to tackle.

Don't let me down on this.

Dayton—Or Not?

When the invitation came asking me to speak again at Dayton, instead of automatically saying OK I gave it a good deal of thought. What are the benefits . . . to me . . . to those who spend an hour or so listening to me?

Yes, I know I usually pull a good crowd. But my interests seem far from those of most hams these days. I'm worried about America's future, and this means generating a high-tech work force for the 21st century . . . and that, to me, means the need for attracting a million youngsters to our hobby as a way to get them personally involved with technology. And in this I know I'm at odds with most hams . . . who prefer to keep our hobby as secret as possible for the enjoyment of a small, white, old, elitist group. I sense little interest in even worrying about the future, much less in trying to do something about it. It's a matter of enjoying ourselves now and to hell with all that crap about kids.

So that puts me in the role of a scold . . . and no one likes a scold. But I don't feel like I'm getting anywhere trying to interest hams in exploring the fun aspects of our hobby. When I talk about the fun of hidden transmitter hunts, instead of eyes lighting up with excitement, I see annoyance. When I talk about the fun of operating from some weird country on a DXpedition, I see eyes all over the room blonking out like Orphan Annie and Sandy, the oldest living dog in history. When I talk about the fun of experimenting on 10 GHz, making contacts from mountaintop to mountaintop, I see people leaving for more interesting talks, whatever they are.

Sometimes I talk about entrepreneurialism and getting rich. This at least keeps people awake. There are so many opportunities to make big money that I get discouraged trying to cheer people on to at least give a try for the brass ring. In my book (*Declare War*) I suggest a bunch of ideas for

Continued on page 66

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CIRCLE 122 ON READER SERVICE CARD

LETTERS

From the Hamshack

Ralph Dittmer KB9BRV, Mundelein IL Because winter is such a dull time of the year, I decided to buy an inexpensive radio kit and build it in my spare time. I don't have much belief in most advertisements, so it was hard to decide which kit I should purchase. Most kits are way out of my price range, and I have found that the quality of many kits leaves a lot to be desired, except for a few. Also, I wonder how young amateurs can afford to build a transceiver or even a transmitter.

Anyway, I read *73* over and over again until I decided to purchase a kit from one of your advertisers, Lectrokit, out of Sandusky, Ohio. When I first opened the package, I got the impression that this radio would never work very well. I proceeded to build it as the instructions said. Even if I had never built any radio, it is almost impossible not to have success with this one. The instructions are foolproof, and it is wonderful to have simple, complete, systematic steps to follow.

I do not know and have never met anyone from Lectrokit but I do think these people should be congratulated for giving average-income earners a chance to be a part of amateur radio, and to build and operate a transceiver. I had my first contact with this set within 10 minutes after I completed building it. I have since had many QSOs. Thanks, *73*, for pointing me to a real honest and affordable product. Also, thank you Mike Agsten WA8TXT for a nice product. Keep up the good work, *73*. I will continue to subscribe, knowing that your advertisers are interested in the "everyone" in amateur radio.

Richard Bill N8ACI, Allegan MI Wayne, I have to apologize that I haven't looked at any of your magazines for a long time. Recently a friend called attention to your editorial in the August 1992 issue of *73*. I am in tune with your feelings about the government-controlled educational system in this country. My background is about 19 years as an electronic engineer, most recently specializing in electromagnetic compatibility. About a year ago, due to some company politics and subsequent reorganization, I found myself out of work and over 40, thus virtually unemployable in west Michigan, where I live. This is perhaps one of those blessings in disguise, for I have been relying on a talent that I discovered through ham radio: teaching. I teach math, electricity, and electronics. My observation is that not only do our schools teach irrelevant subjects but, even worse, the system (including teachers, administrators, parents, and student peer groups) provides a very good education in an undesirable area. Even in "middle-class" areas, somewhere between about four years old and junior high school our kids learn to be afraid to learn and experience understanding. This appears to be especially true in areas of reading and technical-sounding topics like electronics, physics, and others. When I teach I strive to eliminate those fears and to open the door to real understanding, in part by making the topics relevant to the students' environment and personal goals. The longer this continues, the deeper trouble our nation gets into. My goal is to eliminate these fears introduced into real education. As a nation we can't afford to waste a lot of time getting started. It's going to take some time to turn things around.

Ray Stommel N7QAK, Seattle WA After two years, I am letting my *73* subscription lapse in April, and I want to tell you why.

It's an interesting magazine, but I don't give a hoot about building equipment from scratch, nor do I care about ATV or packet. So, that doesn't leave much in most of your issues for me.

I do care about DXing, rag-chewing and operating techniques, but *73* has precious few articles along this line.

Memo to Wayne: We finally received a negative letter for the "Letters" column. It seems that people who don't care about building or any of the newer fun modes don't care about 73. I guess there are other magazines for hams like this—hams who stopped learning and trying new things the day they got their license . . . David N1GPH

Ray, you're right. We should stop trying to get hams to try new things like packet, ATV, OSCAR and RTTY and concentrate on making them better able to chase ops in rare countries off the air (DX awards) and better able to spend the rest of their lives talking about nothing. But we do need to rewrite the regulations for this. Maybe you should take up golf, at least you'd get some exercise . . . Wayne

Gary Wagner VE7RLD, Kamloops, B.C., Canada Wayne, I just finished the February 1993 issue of *73*—"Never Say Die" first, of course. I enjoy your editorials and, although they may not be what I want to hear, they all make you think! On page 76, at the end of "NSD," you have a section titled "In A Rut?" I read that with interest as you seem to have done a lot. How about this: You write that you are health conscious and healthy—how about a Shuttle flight? Imagine the contacts! I'd like to be one of them.

73 is great—keep it up. I hope to QSO one day. W2NSD/1 would be a #1 QSL card in my books.

Gary—Shuttle flight? Lordy, that would be something to brag about! Imagine using a $23 million crapper! But why would I want to go into space just to make a zillion 30-second contacts? Working pile-ups is okay for a few years, but even that pales after awhile and one's interest turns to looking for interesting people to talk with, and talk at length.

You say you'd like to QSO one day . . . well, that's what a letter can start. But what would we talk about? What are your areas of interest and expertise? What can you tell me that I'll find interesting? I don't want to be just a trophy to show off; I'm an interesting person to talk with and would prefer to be prized for that rather than for my location or "fame." When you want people to do something, the first step is to show them the benefit of doing what you want them to do.

I've flown around the world, visiting 25 countries as I went, and operating 20m SSB from the plane over the whole trip. I've DXed from about 65 countries so far. It would be exciting to go up in the Shuttle . . . and they'd be able to say that a 70-year-old man survived the trip (wow!). Other than that, I'm not sure of the benefits to NASA. I'll think about it . . . Wayne

Joe Mott K2UZK, Binghamton NY Wayne, after reading your August 1992 editorial and being completely in agreement with your ideas, I'd like permission to copy and distribute it to my NY State representatives as well as my federal money spenders in the feeble hope they might get some inspiration and consider some of your ideas.

Sure, give it a try, and let me know what response you get. I probably should go 50/50 on the cost of my book for anyone interested in sending copies to politicians . . . Wayne

Dan Hunt N4XAK, Chesapeake VA Wayne, I originally wrote to you back in late August, asking for ideas for a (less and less each day) disabled ham to open a business. I was pleasantly surprised at your quick response. However, you advised me to get into desktop publishing, using a Mac such as your PowerBook. Now, in the latest issue of *73*, you reveal that my nads will be fried by 25 mG. With pals like you, who needs enemies?

All kidding aside, I had wanted to write and thank you for the ideas if I finally took the plunge. Well, I took the plunge, but wound up going into a wholesale/retail business for environmentally sound automotive products. My wife (N4XAM) and I are the sole owners. Much of the courage to do it came from reading your editorials, so we really appreciate the monthly pep talks. (We'll appreciate it more when we begin to turn a profit!)

Your monthly pep talks also encouraged me to volunteer to act as a mentor for an after-school technology club at one of the local schools. Most of the kids were acting like the club was something that parents had forced on them when I started my first meeting with them. By the time we were done, they were all bright-eyed and excited about model rocketry. I built and had the kids fly a model rocket. Now they want to build and fly rockets of their own. Future sessions with them will include a trip to a natural museum, flying radio-controlled aircraft, building and flying model rockets, and amateur satellite communications. Thanks for encouraging me to do that as well. I don't know who's more excited—the kids or me!

So use your PowerBook on a desktop and irradiate that. That's what I do. And on planes I irradiate the tray table. Tell us more about how you're poisoning those poor little kids' minds with technology . . . Wayne

Dick Gobel KICENI/0US, Fairbury NE Wayne, I just want to say how much I enjoyed your September 1992 editorial. Your comments about how socialism is destroying our country were exactly right. You reminded me of a quote I read some 40 years ago: "Never in the history of the world has a country, once started down the road to socialism, ever successfully restored its democratic form of government. Instead, it's ceased to exist."

Robert Mayer N9MRJ, Bartlett IL I have been a police officer for almost 19 years now; prior to that I was in the communications/technical end of law enforcement. After reading Sergeant Beegan's letter in the February 1993 issue, I came away with the impression that officers using radar for speed enforcement were frying birds in mid-flight and burning the hood ornaments off of passing cars.

Maybe he should have noted that law enforcement radar operates at 100 mW or less of power output. It was interesting to note that an article in the same issue, "Fun at 10,000 MHz," proposes operating at a frequency very near the law enforcement radar band at twice the power. If Mr. Beegan wishes to ban law enforcement radar for the reason that it is dosing people with radiation, frying birds and burning holes in Buicks, then the amateur radio service will also suffer the loss of those frequencies.

With the radar units currently in use, most of the officers don't even keep them on all of the time for the simple fact that many motorists have radar detectors. With a quick flip of a switch, the unit is shut down until the next vehicle's speed is checked. No fried birds or Buicks.

I do agree that we should keep after the power companies and the politicians to come forward with the facts, and not continue to act like there is nothing wrong. Facts are what we need, not vague accusations and finger pointing.

The intermittent use of radar shouldn't do enough harm to measure, but there is plenty of evidence (facts) that prolonged use can cause serious problems for officers . . . Wayne

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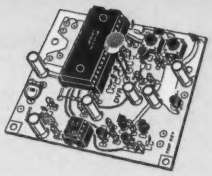
ACCESSORIES



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- **Rugged exciter and PA**, designed for continuous duty.
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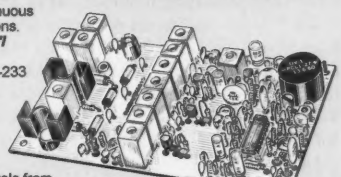

- **TA51**: 50-54, 143-174, 213-233 MHz ...kit $109, w&t $189.
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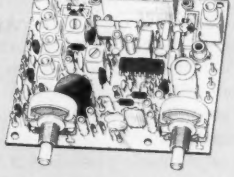

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License Processing Delay Easing

The amateur radio license processing time delay appears to be easing a bit, according to Gordon Girton W6NLG, who administered the Sunnyvale VEC in Northern California. Girton says that he made a check with the FCC's Gettysburg License Processing Facility the week of January 14th and found that the processing time had dropped from the 90-120 days announced by the FCC just before the Christmas holidays to around 60 days in mid-January. W6NLG says that the FCC has processed license applications that it received on November 23rd, and that new licenses were expected to arrive on the West Coast by Monday, January 18.

Girton noted that at Processing Level 1, the FCC has now processed all Form 610 applications that arrived prior to December 2nd. He also says that his VEC operation ships all completed applications to Gettysburg using Federal Express to minimize delay. Since many VE teams and VEC operations use standard US Mail as their delivery carrier, further delays of a few to several days are still possible. *TNX Westlink Report #642, January 28, 1993.*

Amateur Radio Scholarships

The Foundation for Amateur Radio, Inc., a nonprofit organization with headquarters in Washington, DC, plans to administer 47 scholarships for the academic year 1993-1994 to assist licensed radio amateurs. The Foundation, composed of 50 local area amateur radio clubs, fully funds five of these scholarships with the income from grants and from its annual hamfest. The remaining 42 are administered by the Foundation without cost to the various donors.

Licensed radio amateurs may compete for these awards if they plan to pursue a full-time course of studies beyond high school and are enrolled in or have been accepted for enrollment at an accredited university, college or technical school. The awards range from $500 to $2,000, with preference given in some cases to residents of specified geographical areas or to the pursuit of certain study programs. Clubs are encouraged to announce these opportunities at their meetings, on their nets, during training classes, and in their club newsletters.

Additional information and an application form can be requested by letter or QSL card, postmarked prior to April 30, 1993, from: FAR Scholarships, 6903 Rhode Island Avenue, College Park MD 20740. The Foundation for Amateur Radio, incorporated in the District of Columbia, is an exempt organization under Section 501(c)(3) of the Internal Revenue Code of 1954. It is devoted exclusively to promoting the interests of amateur radio and those scientific, literary and educational pursuits that advance the purpose of the Amateur Radio Service.

ARRL Files Automatic Control HF Packet Petition

On February 1, 1993, the American Radio Relay League formally requested a final extension of the *Special Temporary Authority* (STA) which currently authorizes certain amateur radio stations to conduct HF digital communications under automatic control. The present STA was first issued July 7, 1987, and has been extended five times. It expired on February 3, 1993.

The League asked, however, that the STA's termination be delayed until the FCC acts on their Petition for Rulemaking (also filed February 1st) proposing permanent rules governing HF data operation under automatic control. The ARRL said they " . . . firmly believe that the petition will be supported by the amateur radio community as a reasonable accommodation for all concerned . . . "

The petition, which has not yet been assigned a Rule Making file number, seeks to permit automatic control of RTTY and data communications in certain small segments of the 10, 12, 15, 17, 20, 30, 40 and 80 meter ham bands. The ARRL said internationally agreed upon band plan changes made the proposal both workable and acceptable to the majority of ham operators.

The League's petition runs to some 35 pages. The following is a capsule version of the points made by the ARRL.

(1.) The League's goal in submitting the petition is to encourage experimentation, development and refinement of modern automatically controlled data communications . . . and to improve emergency and public service communications.

(2.) The National Telecommunications and Information Administration agrees that the Amateur Service performs a vital role in adapting complicated and expensive technologies to useful communications systems. NTIA is the White House advisor on telecommunications matters. Digital communications networks are advancing at a rapid pace.

(3.) Current data operation in the HF bands includes RTTY, AMTOR, and packet radio. The Amateur Service is also experimenting with such new spectrum-efficient error-correcting digital modes as "Clover" and "Pactor."

(4.) The current rules do not permit automatic networking below 50 MHz and third party communications must use the AX.25 packet protocol. This requirement was based on an ARRL proposal . . . although many amateurs also want automatic high frequency networking authority as well.

(5.) The FCC was properly concerned that automatic "robot" stations will interfere with locally controlled users on the high frequency bands. Several petitions for reconsideration were filed. The ARRL suggested that a small group of data communications enthusiasts determine the feasibility of permanent HF data communications.

(6.) The first STA request was granted in 1987 for a six-month period and has been renewed ever since. HF packet works well, moves traffic—and, with careful frequency selection, provides a public service without undue interference to other amateur activities. But HF packet radio is not compatible with other modes and need separate frequencies.

(7.) The League proposed a plan (RM-7248) in early 1990 that would permit automatically-controlled HF data communications based on a new IARU Region 2 regional band planning effort.

The *International Amateur Radio Union* (IARU) is the worldwide union of national amateur radio societies. It is an international organization that is recognized by the ITU as representing the amateur and amateur-satellite services throughout the world. It is comprised of 126 member societies and is organized into three Regions corresponding with those of the ITU.

The ARRL petition was withdrawn two months later to consider other options for automatic control. These options would be developed through the work of a committee of interested amateurs.

(8.) A January 1992 *QST* survey on automatic digital communications gathered more than 500 responses which were considered by the League's Board of Directors at their meeting in July. It was clear that there should be no band-wide automatic control of HF digital messaging . . . any such operation should be within specific subbands. "The League was faced with the dilemma of its obligation to comply with the band plan for such established by international agreement, and the rejection of the same by United States amateurs."

(9.) The ARRL Board elected to support a plan which would not permit automatic HF data communications between, or among, themselves. Rather, such stations would be limited to communications with stations under local control. The compromise semi-automatic control was criticized as unworkable and unacceptable by HF packeteers.

(10.) Once again the League's Executive

Continued on page 34

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Mini-Quad Loops

Three-fifths-size loops with full-size performance.

by Dean Frazier NH6XK

Eventually a ham discovers the gain, and especially the quietness on receive, of loop antennas, and plans to construct one. Soon enough it becomes apparent that loops for the bands below 20 meters are impossibly large. A square loop on 40 meters (7.15 MHz), for example, needs sides about 35 feet long, which may be unreasonably large to erect, especially in the vertical plane. However, a loop, or any antenna, can be made physically smaller while maintaining full electrical size. This can be accomplished with loading coils, as is frequently done in mobile applications. Unfortunately, coils do introduce some loss. Another approach is to reduce the size of an antenna, e.g. cause it to be resonant above the desired frequency by mechanical shrinking, and then capacitively "stretch" it, so as to achieve the proper electrical length for resonance. The latter is the approach taken here.

The mini-quad loops described are not quite three-fifths full size, and yet, via capacitive loading, are electrically stretched to a full wave. We don't get something (size reduction) for nothing, however. We do suffer some reduction in bandwidth, and we lose about 1/2 dB compared to the performance of a full-size loop. The former limitation may only be a problem on the higher frequencies, for which bands a mini-quad loop can be tailored for a specific portion of the band. Note that the 2:1 SWR bandwidth on 12 and 17 meters (Table 1) and 30 meters is greater than the entire width of the band. Regarding the second limitation, recall that a very good human ear just might detect a 1 dB difference in received signal . . . clearly a 1/2 dB reduction with a mini-quad loop goes unnoticed. Contrast the "cost" of a loss of 1/2 dB, and some reduction of bandwidth, against the "gain" of a 40% size reduction. Add to this the forward gain (when mounted vertically) of several dB, and side rejection, and the mini-quad loop begins to look pretty good.

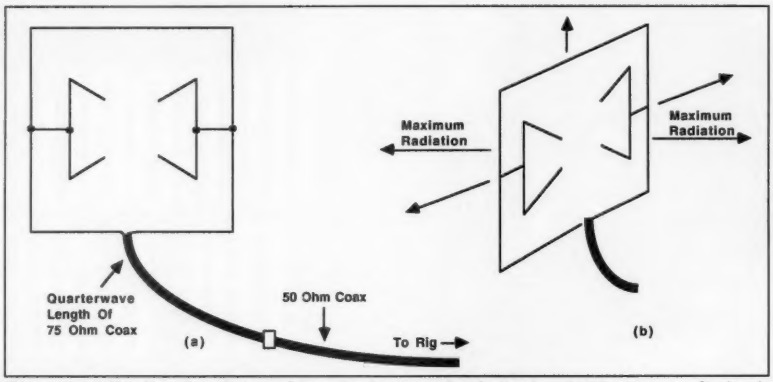

Figure 2. a) Feeding the mini-quad loop for horizontal polarization. b) Maximum radiation is off of the plane of the loop.

For low-angle radiation, the loop works best when mounted vertically and fed at the bottom, but if this is not possible, mount it horizontally and you can still communicate better than with a dipole. (Inspection of radiation patterns shows that while there are low-angle lobes for a mini-quad loop when mounted vertically, there is also considerable radiation in the plane of the loop. Many hams believe full-wave loops only radiate perpendicularly to the loop plane. This is just not so, and my personal experience confirms this.)

Mounted in the vertical plane, you'll have to arrange to rotate (point) the broad side of the loop; horizontally mounted, the radiation is omnidirectional. (Height and visual impact restrictions in my planned neighborhood preclude my outdoor loops being vertical . . . but I've had good success with them mounted more or less horizontally on the roof with a few inches of "standoff," and also hung vertically on walls in the house. With a mini-quad loop on my living room wall inside the house, I have communicated as far away as Minnesota from Hawaii, with 5 watts on 12 meters.)

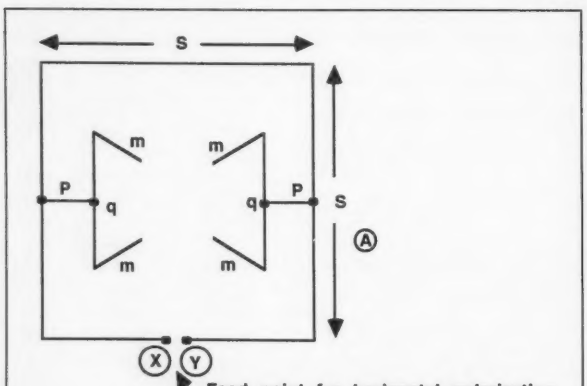

Figure 1. Diagram of mini-quad loop. See Table 1 for measurements.

Construction

The dimensions shown in the tables are for wire mini-quad loops, 2-40 meters. Parameters S, p, q, and m are defined below:

S = side length, feet (The loops are square.)
p = capacitance hat inset, feet
q = capacitance hat length, feet
r = capacitance hat fold-in leg, feet
(Or inches if so specified.)
See Figure 1.

For the ambitious (those desiring to build a mini-quad loop for 80 or perhaps 160 meters, or for tailoring for a different portion of a band, such as 10 meters) the following formulae are provided:

$$S = \frac{147.917}{f\ (MHz)} \text{ feet}$$

p = 0.128 x (S) feet
q = 0.774 x (S) feet
m = 0.304 x (S) feet

I feed the mini-quad loop with 50 ohm coax from the rig, terminating in a quarter wave of 75 ohm coax at the antenna feed point. For example, on 40 meters, 7.15 MHz, with 75 ohm coax (Velocity Factor = 0.75), a quarter wave is:

$$\frac{246(0.75)}{7.15\ MHz} = 25.804 = 25'\ 9\ 5/8"$$

See Figures 2a and 2b.

At the feed point, one end of the loop connects to the 75 ohm coax center conductor, the

Continued on page 14

New MFJ CW Transceivers

. . . throw this *tiny* CW rig in a corner of your briefcase and enjoy DXing and ragchewingwherever you go . . . you get a high performance superhet receiver, crystal filter, RIT, AGC, vernier tuning, sidetone, speaker, up to 5 watts output, semi/full-break-in . . .

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Copper Dual-Band Super J-Pole Antenna

Build it in less than an hour.

by Marty Gammel KAØNAN

While looking for an antenna project to build I remembered seeing a Marine antenna called the Super J-Pole in the 1988 *ARRL Antenna Handbook*, which claimed a 6 dB gain over a quarter-wave ground plane. I didn't have a machine shop at my disposal to fabricate the parts shown in the Marine antenna article so I set about redesigning the antenna using materials that were easy to find and work with. I have had very good results working with copper J-poles, so I built my refined version of the classic J-pole. I then added a short insulating section, the extra half wave of vertical length, and the needed half-wave matching stub.

Materials

All the materials except the S0239 fitting can be found at any good hardware store, and the whole antenna can be made in less than one hour.

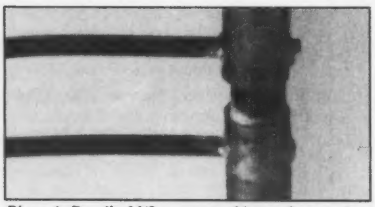

Photo A. Detail of 1/2 wave matching stub mounting.

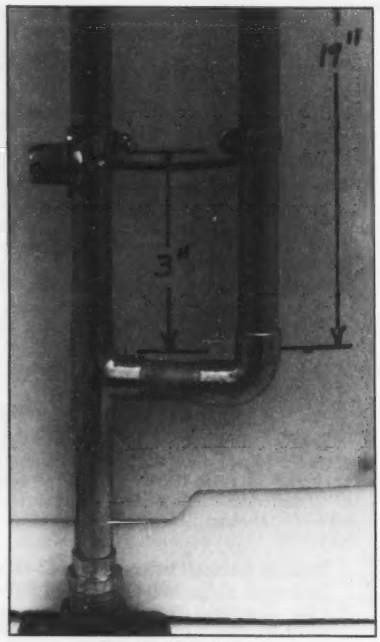

Photo B. J-Pole feed point.

In my design I use 1/2" copper schedule M tubing and 1/4" soft copper tubing. I had experimented with using a Teflon insulator, but have since changed my design to use a 9" length of hardwood dowel with three coats of lacquer as the insulator, for more strength.

Clean all the tubing, and then from the 1/2" tubing cut one piece each of the following lengths: 57-1/2"; 38"; 19"; 2", and a piece about 3" long for a stub to mount the antenna. In addition to the tubing, buy a 1/2" elbow, a 1/2" Tee, two 1/2" end caps, a 1/2" threaded fitting, and a cast iron floor flange for mounting. Get a piece of 3/16" or 1/4" soft copper tubing 42" long. Find the center of the 1/4" tubing and bend it around a 1"-to-1-1/4" diameter water pipe or dowel.

Put the Heat to It

Now fire up the torch and start the assembly process from the bottom up. See Figure 1. Use flux on all joints, solder the 1/2" threaded fitting to the mounting stub, and solder the 1/2" Tee fitting. Then proceed with the 57-1/2" section, 2" cross piece, and 19" section. Pay close attention to getting the 19" piece parallel to the 57-1/2" piece. After these have cooled, drill through both the 57-1/2" section of 1/2" tubing and the hardwood dowel about 1/4" from the top end of the 1/2" tubing, and the bottom of the 38" section of tubing. (See Photo A.) Then insert the 1/4" tubing through the 1/2" tubing and dowel assembly. Sweat solder the 1/4" tubing to the 1/2" tubing and sweat solder the end caps. After these have cooled, clean the entire antenna, bend the half-wave matching section to a half circle of about 4" radius around the antenna to help the balance and match.

Simplify the Feed Point

The feed point also needed to be made simpler, so I elongated one of the mounting holes of a panel mount SO-239 fitting and inserted a stainless steel adjustable band clamp. This goes on the 57-1/2" long section of 1/2" tubing. A short 2-3/4" length of #14 copper stranded wire is soldered to the center terminal to go over to the 19" section. I used another stainless clamp to attach this. (See Photo B.) While experimenting to find the proper feed point, I found that the distance above the crossbar should be about 3".

Building Suggestions

1. You may use a Fiberglas rod as an insulator, but you will have to be very careful with the torch or you may weaken or burn the rod, or make it brittle.
2. When cutting the 1/2" copper tubing, cut the 57-1/2" piece from one end of the 10' length, and the 38" piece from the other end. By doing this you will have factory-cut edges for inserting the 1/2" dowel.
3. Be sure to keep the flame of the torch away from the insulator to avoid burning it.
4. Use paste flux on all joints when fitting the pieces together. Use enough flux, since you will be cleaning the entire antenna with solvent after assembly.
5. Use a weight to hold the 19", 57-1/2", and 2" pieces, and the Tee and the elbow, flat when they are sweat soldered together.
6. Use a ruler or caliper to check the spacing

Continued on page 15

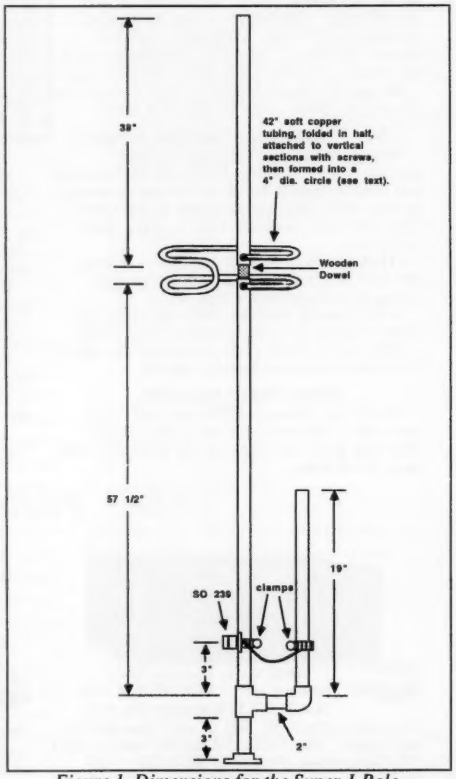

Figure 1. Dimensions for the Super J-Pole.

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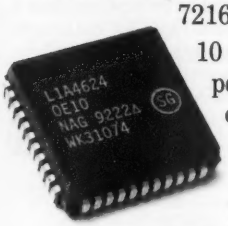

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Mini Quad Loops

Continued from page 10

other end to the braid side. Or, you can use an S.O. connector mounted in a convenient manner (I use PVC strips).

Apartment/Condo Dwellers and/or New Hams

See Table 1 for 10 meter dimensions, Table 2 for 2 and 6 meter dimensions.

It is a simple project to mount a mini-quad loop on the wall or ceiling in an apartment, or in the attic of a house. A loop can easily be set up around a picture frame. Small wire, two or three inches of standoff from the wall, some white paint, and/or curtains or a large picture, etc., can be used to make the loop invisible and yet still be effective.

Summary

You'll get 2-3 dB gain over a dipole, and notice much quieter reception. Build the mini-quad loops according to the dimensions supplied. Trim the capacitance legs only as necessary to achieve resonance (lowest SWR at feed point) if metal, wiring, wood, etc., in the near field of the loop cause detuning. The mini-quad loops can form the driven elements of two- or three-element cubical quad beam antennas.

Quad loops don't have to be large to be good performers. And they are "quiet."

NOTE: Mini-Quad-Loops have been constructed, tested and used on 2, 12, 20, and 40 meters, with the data of Tables 1 and 2, with good results. Initial SWRs in all cases, at the feed point, were at worst 1.5:1. Adjustment of the angle between p and m allows improvement in SWR. In each of these cases the relationships for S, p, q, and m given in the text worked—e.g.:

$$S = \frac{147.917}{f\ (MHz)}$$

The table values for 5, 10, 15, and 30 meters are derived, but based on the experiments on 2, 12, 20, and 40 meters, I have no reason to believe that the derived data is not good data.

Acknowledgements: L.A. Moxon G6XN, *HF Antennas For All Locations*, reference to capacity hat loaded mini-quad by G3YDX.

$$S = \frac{147.917}{f\ (MHz)}\ \text{feet}$$

p = 0.128 (S) feet x 12 = inches
q = 0.774 (S) feet x 12 = inches
m = 0.304 (S) feet x 12 = inches
T = Wire needed to build mini-quad-loop (includes extra for joint-wraps), feet
B = Approximate bandwidth, kHz

Band (meters)	10	12	15	17	20	30	40
Frequency (MHz)	28.400	24.940	21.225	18.118	14.150	10.125	7.150
S (feet, inches)	5' 2-1/2"	5' 11-3/16"	6' 11-5/8"	8' 2"	10' 5-7/16"	14' 7-5/16"	20' 8-1/4"
p (inches)	8"	9-1/8"	10-11/16"	12-9/16"	16-1/16"	22-7/16"	31-3/4"
q (inches)	48-3/8"	55-1/6"	64-3/4"	75-13/16"	97-1/16"	135-11/16"	192"
m (inches)	19"	21-5/8"	25-7/16"	29-13/16"	38-1/8"	53-5/16"	75-7/16"
T (feet)	37'	42'	50'	58'	74'	103'	146'
B (kHz)	400	350	300	250	200	150	100

Table 1. 10-40 meters

Band (meters)	2	6
Frequency (MHz)	147.00	52.00
S	12-1/16"	34-1/8"
p	1-9/16"	4-3/8"
q	9-5/16"	26-7/16"
m	3-11/16"	10-3/8"
T	8'	20'

Table 2. 2 and 6 meters (S, p, q, m, and T as previously defined).

Copper Dual-Band Super J-Pole Antenna *Continued from page 12*

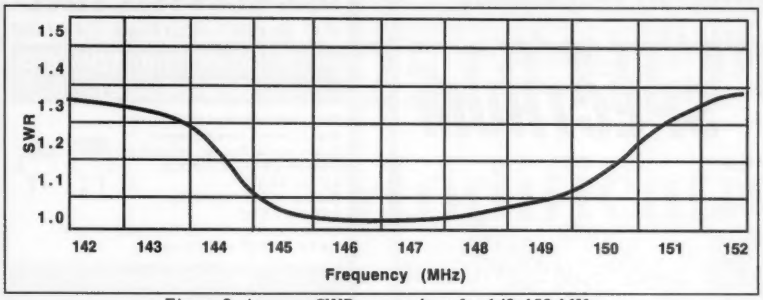

Figure 2. Antenna SWR curve chart for 142-152 MHz.

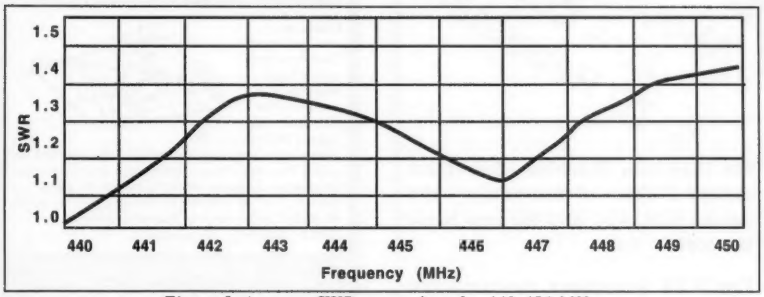

Figure 3. Antenna SWR curve chart for 440-450 MHz.

between the 19" and 57-1/2" pieces, to keep them parallel to each other.

7. When drilling the SO-239 fitting, use a drill press. Be careful not to drill into the threads of the fitting. After the holes are drilled, file the opening flat for a better band clamp fit.

Parts List

1	10-foot section of schedule M 1/2" copper tubing
1	1/2" copper elbow
1	1/2" copper Tee fitting
2	1/2" copper end caps
1	1/2" copper threaded fitting (for mounting)
1	1/2" cast floor flange (for mounting)
1	Piece of 3/16" or 1/4" soft copper tubing 42" long
1	Piece of 1/2" hardwood dowel or Fiberglas rod
1	SO-239 panel mount coaxial fitting
1	Piece of #14 stranded copper wire
2	3/8" by 7/8" stainless band clamps

Tools needed:

- Tape measure
- Tubing cutter
- Propane torch
- Solder and flux
- Electrical tape
- Caulking compound
- Screwdriver
- A weight to keep parts aligned while soldering
- Steel wool or a Scotch Brite pad (for cleaning all copper)
- Spray can of clear exterior lacquer (to finish-coat completed antenna)

8. After the best match has been found, you may want to solder the SO-239 and the stranded wire end to the 1/2" tubing.

9. When the antenna has been cleaned and matched, spray the entire antenna with a coat or two of clear lacquer to keep it looking nice.

10. After everything else has been done, apply silicon or a butyl rubber compound to the insulating section, then cover the joint with electrician's tape for a weathertight seal.

11. A 1/2" pipe coupling and a length of pipe may be used in place of floor flange for mounting in a roof tripod.

HR2510 Hi-Power Modification

Increase the performance of this popular HF rig.

by Carl Merrill

After reading the high power modification originally published in *73 Amateur Radio Today* ("Beefing Up the Uniden and the HTX-100" by M. T. Stacey KC4HGH, September 1989, p. 48) and then changed by the original writer (*73 Amateur Radio Today*, "Updates," November 1989, p. 76), I discovered another method that is easier to implement and has given consistent results.

The modification in the 1989 article and update requires you to change the output transistor from a type 2SC477 to a type 2SC497, then change the pre-driver transistor Q134 from a type 2SC2086 to a type ECG-340.

I found that the ECG-340 didn't really give any more drive to the driver transistor, for it is an emitter-follower, with a gain of less than one, so I left the 2SC2086 portion of the circuit alone.

The Modification

The following modification will give you marked improvement in the power output of the HR2510 and is easy to implement:

1. Change the output from a 2SC477 to a 2SC497 and make the necessary bias adjustments as follows:

Connect the radio output to a 50 ohm dummy load and set the frequency to 28.005 MHz, USB mode, with no modulation.

Hook up a meter (0-100 mA scale) between test points TP4 (+) and TP2 (-) to monitor final amplifier current.

Key the transmitter with no modulation and adjust VR112 for 80 mA collector current (Q132).

Place the meter's negative lead on TP3 and check the driver current.

Adjust VR113 for a driver current of 50 mA, if necessary.

Replace shorting bars into TP4, TP3 and TP2.

While tuned to 28 MHz, adjust the AM power output to about 5 watts by adjusting VR107.

3. Turn off the power and locate Q134, the 2SC2086 amplifier transistor. Cut the foil (as shown in Figure 2) to remove the network from the emitter. Remove the 0.01 uF capacitor (C135) from the collector of this transistor to ground. Bridge the foil from the open end of the network to the collector foil. Now, solder the removed 0.01 uF (C135) to the bottom of the board from the emitter to ground. See Figures 1 & 2 for details.

4. Check your work carefully for any solder bridges and turn on the power. The AM output will normally jump up to about 15 watts after this modification. Turn the AM power output down to about 12 to 13 watts by adjusting VR107. This is plenty for this radio and will sound real nice on the air. You should find that the SSB power will now be around 25 to 32 watts.

5. Adjust the SSB output for peak power by feeding a single 1 kHz tone (or dual tone) into the radio while adjusting VR104 (the SSB ALC pot).

6. If your radio needs further alignment, consult the appropriate service manuals for the HR2510 and the HTX-100. The 2SC497 may be obtained from RF Parts, 1320 Grand Ave., San Marcos CA 92069. Tel: (800) 854-1927 (for orders only).

Results

The purpose of this change is to make the 2SC2086 provide gain, for in an emitter follower configuration, the gain is always less than 1. It works better, and saves the cost of the ECG-340. I have completed this modification on approximately eight different radios and they work fine. They can be heard in places they couldn't reach before.

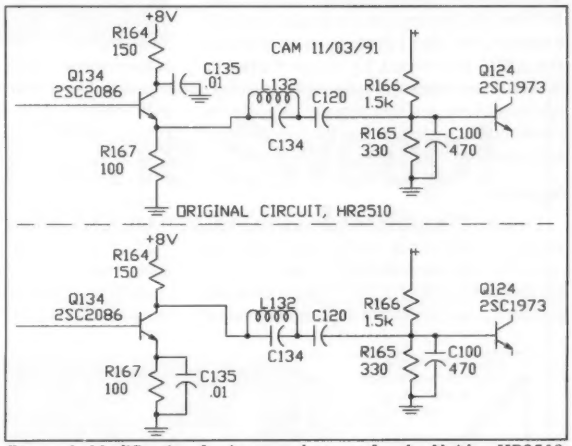

Figure 1. Modification for increased power for the Uniden HR2510. Top circuit is the original; bottom circuit is the modified version.

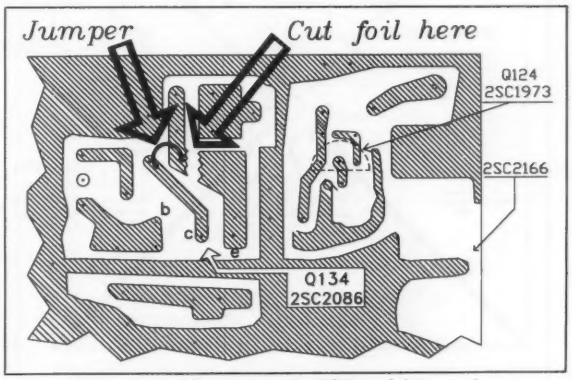

Figure 2. Modifications to the PC board, bottom view.

10 Meter X-Beam

Upgrade your antenna as well as your license.

by John E. Williams N5SJZ

After a year as no-code Techs, my wife Debby N5SKA and I decided it was time to upgrade to Tech-plus and work some DX. With help and encouragement from Joe Nunnamaker KD3VR, passing 5 wpm was much less of a chore than we had imagined. The big day was here and we had our 5 wpm Certificates of Successful Completion in hand; it was time to work the world.

I had previously purchased a small 10 meter rig and had put up a simple 10 meter horizontal dipole in anticipation of this day. Over the next few weeks, even though I made several contacts, I was not happy with the results. I felt it was time to upgrade my antenna. First I considered several commercial antennas. However, I had caught the bug for homebrewing with a 2 meter amplifier kit and had met Joe in the process, but that's another story. Since this was my first antenna project, I wanted it to be simple, high performance, and low cost. At first my criteria seemed mutually exclusive, but then I came upon an article in the *ARRL Handbook* by Brice Anderson W9PNE concerning X-Beam antennas. I spoke with Joe and told him my idea. He enthusiastically agreed to lend his expertise and help with the project.

Materials

I wanted to construct the antenna with materials I could locate at the local hardware store. So, with Joe and Debby, I paid a visit to the hardware store. For the X-beam arms, we considered aluminum and copper. We selected copper tubing for several reasons. First, copper is less than half the price of aluminum. Second, unlike aluminum, copper can be soldered-to directly. And finally, copper has a lower resistance to radiation, perhaps giving a slight performance edge. For the center support we chose a 1/2" thick, 2' x 2' square precut piece of plywood.

After purchasing the necessary materials on a Saturday, we planned to build and put the antenna on the air the next Saturday. All the materials for the antenna cost less than $40.

Construction

The first step is to prepare the copper tubing and plywood. Cut the four 8' pieces of the copper tubing to 6'11" with a pipe cutter, then use extra-fine steel wool to polish the copper tubing to remove oxidation and let the beauty of the copper show. To ensure that the antenna will continue to look good and resist the elements, apply several coats of a spray-on acrylic protectant to the copper tubing. Prepare the plywood with two or three coats of weatherproof paint, allowing two days of drying time between each coat. Next week, the plywood and the tubing will be ready to go.

The first step in actual construction is to draw an X on the center board where the copper tubing arms will go. After drawing the X, measure 2.25" from dead center on each line. This is where the end of each arm is placed on the board. Place the pipe brackets over one arm and use this arm as a guide for marking holes for the bracket bolts on each line. Next, drill the holes for the brackets and a 1.25" hole at dead center for the mast. If you are using a larger or smaller mast you should adjust the center hole size accordingly.

The next step is to drill a small hole on the

Photo A. The construction team with materials. Left to right: John Williams N5SJZ, Debby Williams N5SKA, Joe Nunnamaker KD3VR.

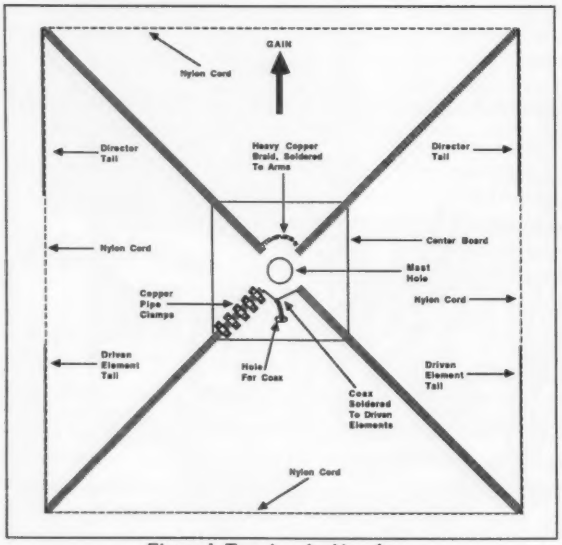

Figure 1. Top view, looking down.

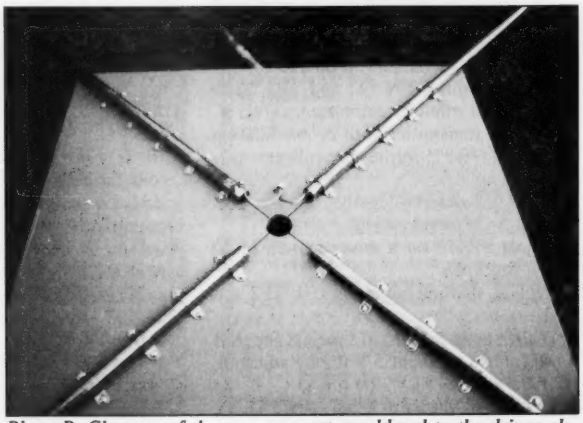

Photo B. Close-up of the coax connector soldered to the driven element arms.

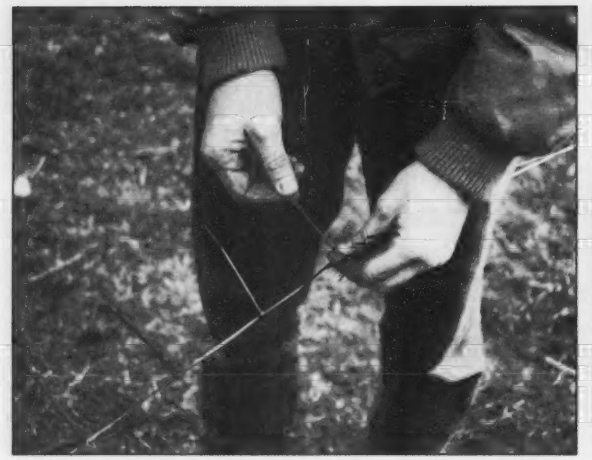

Photo C. Using plastic wire ties to secure tails to nylon supporting cord.

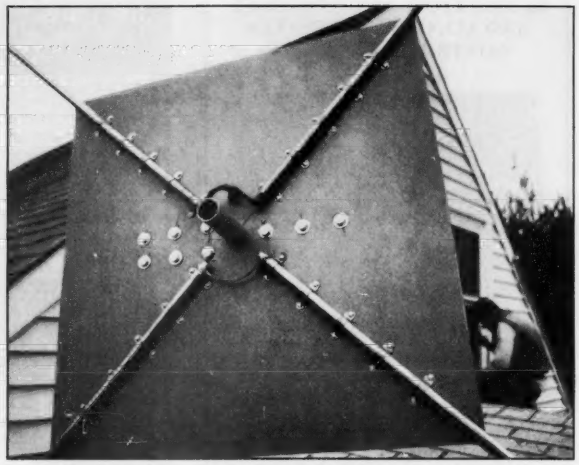

Photo D. Close-up top view of finished antenna center board.

center board between two arms. It makes no difference which two arms you choose at this point since they are all the same length. Route the pigtail coax connector (or plain coax) through the center board and solder the inner conductor to one arm and the outer braid to the other. These now become the driven arm elements. To ensure the best contact, clean the areas on the arms to be soldered with steel wool to remove the acrylic protectant previously applied. Since the weather was somewhat cold, we used a propane torch for soldering instead of a soldering iron. Since we were concerned that the paint would be blistered by the heat, we solved this potential problem by placing a double thickness of aluminum foil under the arms when soldering close to the center board. After soldering the coax connector, solder a heavy piece of copper braid to the other two arms. The arms connected with copper braid become the director arms.

Now that the driven element and director arms have been determined, it's time to solder the element tails to the ends of the arms. Since the element tails will not be under stress, we chose 16-gauge enamel-coated solid copper wire instead of Copperweld wire. Start with each driven element tail 36" long and each director tail 30" long. If you use aluminum tubing or smaller gauge wire you will need to start with each element tail 12" longer to ensure that the antenna can be tuned. If using coated wire, carefully scrape away about 1" of the enamel coating at the ends of the wire to be soldered. To ensure a durable connection, bend the ends of the wires in 1", then solder them parallel to the arms.

To provide support for the element tails, use nylon cord strung through the ends of the arms. To prepare the arms for the cord drill two 1/8" holes, located 1/2" from the ends of each arm, parallel with the center board. Pass one length of nylon cord through the holes, pull it tight and tie it securely. Place the element tails beside the nylon cord and use plastic wire ties to secure them to the cord. The cord not only supports the element tails, it also strengthens the entire antenna structure.

Mounting and Finishing

Now it's time to prepare the antenna for mounting. For good strength use three L-brackets to support the antenna. Place two brackets on one side of the center board and one opposing the other two. Start the L-brackets about 1" away from the edge of the center hole to allow for proper U-bolt placement. After marking and drilling holes, mount the L-brackets securely to the center board. After mounting the L-brackets, place the antenna mast through the center hole and secure the antenna to the mast with three U-bolts.

Now that the antenna is mounted, the next step is to form a current balun (RF choke). Form the balun by winding six turns of coax (directly below the center board) into a 6" i.d. loop. This keeps RF at the antenna and prevents stray RF from coming down the coax cable.

You are now down to the finishing touches to make the antenna last longer and perhaps perform better. Placing plastic wire ties around the coax directly above and below the coax feedhole in the center board will provide strain relief for the coax. Coax seal applied to exposed coax will keep water out and will prevent premature coax failure. Finally, to help ensure a longer life for the center board, apply touch-up paint to any small chips that resulted from drilling.

Photo E. Bottom view of center board. John making current balun (RF choke).

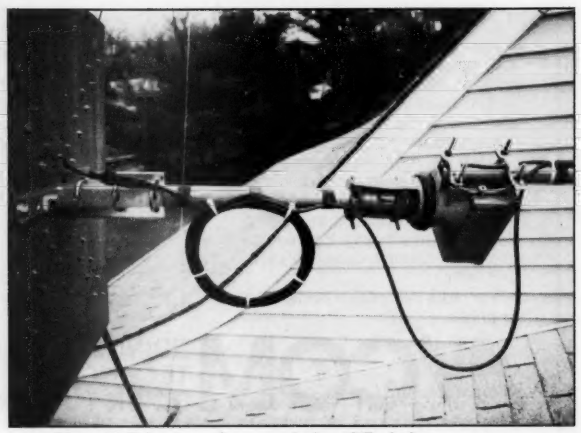

Photo F. Side view of current balun (RF choke) on antenna.

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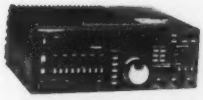

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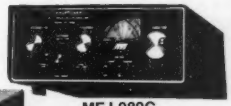

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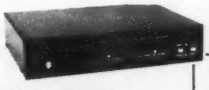

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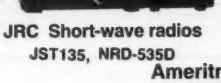

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CIRCLE 41 ON READER SERVICE CARD

The final step before going on the air is tuning. First, remeasure each element tail. At this point the driven element tails are 36" and the director tails are 30". The driven element tails must be exactly 6" longer than the director element tails. If they are not the same, cut them to length. To tune the antenna, place it in its final position and measure the SWR. The antenna is tuned by taking the antenna down, cutting 1/4" off each tail, putting the antenna up, and remeasuring the SWR. It will most likely take several rounds of checking SWR, cutting the tails, and remeasuring SWR before the antenna is tuned. Our final measurement for each driven element tail was 34", while each director tail was 28". As shown in Table 1, the X-Beam antenna is usable from one end of 10 meters to the other! Since the tail lengths may vary according to the material used in the antenna construction, the antenna height, etc., it is much better to start with tails a bit too long and cut to size.

Performance

The X-Beam more than met my expectations. According to the *ARRL Handbook*, forward gain is about 5 to 6 dBd. Also, the angle of radiation seems very low. The first noticeable difference in performance was that we could hear many more DX stations than with the dipole.

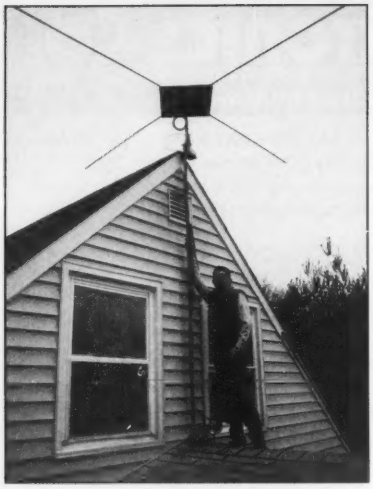

Photo G. The finished antenna.

I have gotten reports of 2 to 3 S-unit differences from both stateside and DX stations, depending on where the beam is pointed. With only 25 watts, I have been able to work pile-ups to DX stations in Senegal, New Zealand, the Balearic Islands, Denmark and Japan, to mention a few. Now I have a fighting chance in pile-ups. Put one up and you will, too.

Parts List

4	Pieces 1/2" copper tubing, cut to 6'11" each
1	2-foot-square piece plywood
1 pint	Weatherproof paint for plywood
1 can	Spray acrylic protectant for tubing
15'	16-gauge copper wire
4"	Heavy copper braid
3	Heavy L-brackets
3	U-bolts
20	1/2" pipe clamps
40	Small bolts, 1/4" x 3/8"
9	Large bolts, 3/8" x 1"
	Nylon cord
	Plastic wire ties
	Coax-seal

SWR Measurements

Frequency	SWR
28.0	1.6
28.1	1.5
28.2	1.4
28.3	1.4
28.4	1.3
28.5	1.3
28.6	1.3
28.7	1.3
28.8	1.3
28.9	1.2
29.0	1.2
29.1	1.2
29.2	1.2
29.3	1.3
29.4	1.3
29.5	1.3
29.6	1.4

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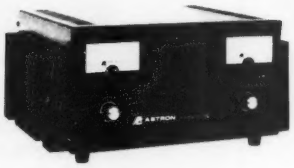


MODEL VS-50M

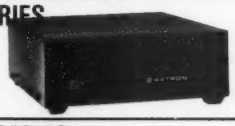
SPECIAL FEATURES

- SOLID STATE ELECTRONICALLY REGULATED
- FOLD-BACK CURRENT LIMITING Protects Power Supply from excessive current & continuous shorted output
- CROWBAR OVER VOLTAGE PROTECTION on all Models except RS-3A, RS-4A, RS-5A, RS-4L, RS-5L
- MAINTAIN REGULATION & LOW RIPPLE at low line input Voltage
- HEAVY DUTY HEAT SINK • CHASSIS MOUNT FUSE
- THREE CONDUCTOR POWER CORD except for RS-3A
- ONE YEAR WARRANTY • MADE IN U.S.A.

PERFORMANCE SPECIFICATIONS

- INPUT VOLTAGE: 105-125 VAC
- OUTPUT VOLTAGE: 13.8 VDC ± 0.05 volts (Internally Adjustable: 11-15 VDC)
- RIPPLE Less than 5mv peak to peak (full load & low line)
- All units available in 220 VAC input voltage (except for SL-11A)

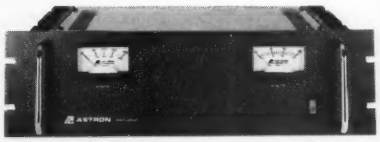
SL SERIES



MODEL	Colors Gray	Colors Black	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
• LOW PROFILE POWER SUPPLY						
SL-11A	•	•	7	11	2¾ x 7⅝ x 9¾	11

RS-L SERIES

MODEL	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
• POWER SUPPLIES WITH BUILT IN CIGARETTE LIGHTER RECEPTACLE				
RS-4L	3	4	3½ x 6⅛ x 7¼	6
RS-5L	4	5	3½ x 6⅛ x 7¼	7



RM SERIES

MODEL RM-35M

MODEL	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
• 19" RACK MOUNT POWER SUPPLIES				
RM-12A	9	12	5¼ × 19 × 8¼	16
RM-35A	25	35	5¼ × 19 × 12½	38
RM-50A	37	50	5¼ × 19 × 12½	50
RM-60A	50	55	7 × 19 × 12½	60
• Separate Volt and Amp Meters				
RM-12M	9	12	5¼ × 19 × 8¼	16
RM-35M	25	35	5¼ × 19 × 12½	38
RM-50M	37	50	5¼ × 19 × 12½	50
RM-60M	50	55	7 × 19 × 12½	60

RS-A SERIES

MODEL RS-7A

MODEL	Colors Gray	Colors Black	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
RS-3A		•	2.5	3	3 × 4¾ × 5¾	4
RS-4A	•	•	3	4	3¾ × 6½ × 9	5
RS-5A		•	4	5	3½ × 6⅛ × 7¼	7
RS-7A	•	•	5	7	3¾ × 6½ × 9	9
RS-7B	•	•	5	7	4 × 7½ × 10¾	10
RS-10A	•	•	7.5	10	4 × 7½ × 10¾	11
RS-12A	•	•	9	12	4½ × 8 × 9	13
RS-12B		•	9	12	4 × 7½ × 10¾	13
RS-20A	•	•	16	20	5 × 9 × 10½	18
RS-35A	•	•	25	35	5 × 11 × 11	27
RS-50A	•		37	50	6 × 13¾ × 11	46

RS-M SERIES

MODEL RS-35M

MODEL	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
• Switchable volt and Amp meter				
RS-12M	9	12	4½ × 8 × 9	13
• Separate volt and Amp meters				
RS-20M	16	20	5 × 9 × 10½	18
RS-35M	25	35	5 × 11 × 11	27
RS-50M	37	50	6 × 13¾ × 11	46

VS-M AND VRM-M SERIES

MODEL VS-35M

• Separate Volt and Amp Meters • Output Voltage adjustable from 2-15 volts • Current limit adjustable from 1.5 amps to Full Load

MODEL	Continuous Duty (Amps) @13.8VDC	@10VDC	@5VDC	ICS* (Amps) @13.8V	Size (IN) H × W × D	Shipping Wt. (lbs.)
VS-12M	9	5	2	12	4½ × 8 × 9	13
VS-20M	16	9	4	20	5 × 9 × 10½	20
VS-35M	25	15	7	35	5 × 11 × 11	29
VS-50M	37	22	10	50	6 × 13¾ × 11	46
• Variable rack mount power supplies						
VRM-35M	25	15	7	35	5¼ × 19 × 12½	38
VRM-50M	37	22	10	50	5¼ × 19 × 12½	50

RS-S SERIES

MODEL RS-12S

• Built in speaker

MODEL	Colors Gray	Colors Black	Continuous Duty (Amps)	ICS* Amps	Size (IN) H × W × D	Shipping Wt. (lbs.)
RS-7S	•	•	5	7	4 × 7½ × 10¾	10
RS-10S	•	•	7.5	10	4 × 7½ × 10¾	12
RS-12S	•	•	9	12	4½ × 8 × 9	13
RS-20S	•	•	16	20	5 × 9 × 10½	18

*ICS—Intermittent Communication Service (50% Duty Cycle 5min. on 5 min. off)

73 Review

by Steven K. Roberts N4RVE

The Ultratorch

A tool for liberation.

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P.O. Box 68
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Telephone: (800) 558-9413
Price Class: $60-$80 list, depending on model.

I'm sure you know the problem. There is some trivial soldering task to be performed . . . out in your car, up on the roof, or under the hood of your car. You spend far more time messing around with tangled extension cords than it takes to do the work itself.

Or perhaps it's worse than that: You're bicycle-mobile, halfway up Slumgullion Pass in Colorado, chatting with a mountain-topper, when he starts complaining that your signal is intermittent. You stop to look, and you see it—the kluge antenna connection you kept meaning to fix has come loose at last. Do you try to hold it together with duct tape, or pitch camp and wait for an airlift?

Sometimes it's merely irritating—you're in your shop, crawling around some piece of gear, and your coffee sails off the corner of the bench when you tug on the iron's cord in a futile quest for that extra three inches. Argh.

It's a pain to be tethered, isn't it?

Photo A. The UT-100Si from Master Appliance.

The Solution

Numerous cordless soldering irons have appeared over the years, both electric and butane. As a full-time nomad, I've tried them all with generally disappointing results . . . dreading on-the-road soldering tasks until now. Last year I finally found a portable tool that is actually MORE useful than any of my conventional lab soldering stations—the Ultratorch from Master Appliance.

The company offers a number of models, but my favorite is the UT-100Si (self-igniting). Available with 16 different tips plus a heat-shrink nozzle, this 10-inch, 5.5-ounce tool will change your life. I actually carry TWO of them on my bicycle: one permanently fitted with the heat-shrinker, the other with a 0.5 mm tapered-needle soldering tip. They both see heavy use in labs and on the road. Using it is a simple matter of turning on the gas at a suitable level and pushing the built-in piezoelectric igniter button. After a few seconds it's ready for work—it's that simple.

Ultratorches run on standard butane and refill easily from the canisters sold in grocery stores for cigarette lighters. The self-igniting model gets about three hours of use on its mid-range heat setting. There is also a model without the igniter (the UT-100)—this gets less running time per tankful, but has the advantage of a 2372-degree-F torch mode (the UT-100Si will do that too, but only with its relatively fragile innards exposed . . . not recommended).

I have found the power to be quite acceptable for all the usual hardware hacking and maintenance tasks, up to and including coax connectors and PC-board ground planes (using a larger tip, of course). At the low-wattage settings the tiny tip is comfortable around delicate circuitry, and the heat shrinker will pay for the tool all by itself. Quality is excellent, and various little touches indicate that the designers paid close attention to the needs of the market—like a flat area on one side to keep it from rolling away.

Another model in the Ultratorch line is the UT-50, a pencil-length unit (6" and 2.2 oz.) complete with pocket clip. It's not self-igniting, but it has all the other features, including torch mode. Though it only gets about 20 minutes on a charge, it fits just about anywhere and is comfortable around dense packaging.

I have probably burned over a liter of butane in my two units—over 100 hours of use. I've been on my back in a campground, fixing a bicycle wiring harness connector . . . deep in a prototyping project in a Silicon Valley lab, whipping up a switching power supply . . . under the hood of a diesel truck, grafting a power cable . . . on an antenna tower, fixing a preamp . . . all with Ultratorch in hand. If you have relegated the cordless soldering irons of yesteryear to the dusty recesses of your flea-market FOR SALE box, give the Ultratorch a try. You just may end up getting rid of your AC-only bench iron instead.

RAMSEY ELECTRONICS

COM-3 $2995.00

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COM-3, the world's most popular low-cost service monitor. For shops big or small, the COM-3 delivers advanced capabilities for a fantatic price—and our new lease program allows you to own a COM-3 for less than $3.00 a day. Features •Direct entry keyboard with programmable memory •Audio & transmitter frequency counter •LED bar graph frequency/error deviation display •0.1–10.000 µV output levels •High receive sensitivity, less than 5 µV •100 kHz to 999.9995 MHz •Continuous frequency coverage •Transmit protection, up to 100 watts •CTS tone encoder, 1 kHz and external modulation.

RSG-10 $2495.00

SYNTHESIZED SIGNAL GENERATOR

Finally, a low-cost lab quality signal generator—a true alternative to the $7,000 generators. The RSG-10 is a hard working, but easy to use generator ideal for the lab as well as for production test. Lease it for less than $3.00 a day. Features •100 kHz to 999 MHz •100 Hz resolution to 500 MHz, 200 Hz above • – 130 to + 10 dBm output range •0.1 dB output resolution •AM and FM modulation •20 programmable memories •Output selection in volts, dB, dBm with instant conversion between units •RF output reverse power protected •LED display of all parameters—no analog guesswork!

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CT-90 9 DIGIT 600 MHz

CT-125 9 DIGIT 1.2 GHz

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NEW CT-250 2.5 GHZ

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ALL COUNTERS ARE FULLY WIRED & TESTED

MODEL	FREQ. RANGE	SENSITIVITY	DIGITS	RESOLUTION	PRICE
CT-50	20 Hz–600 MHz	< 25 mV to 500 MHz	8	1 Hz, 10 Hz	$189.95
CT-70	20 Hz–550 MHz	< 50 mV to 150 MHz	7	1 Hz, 10 Hz, 100 Hz	$139.95
CT-90	10 Hz–600 MHz	< 10 mV to 150 MHz < 150 mV to 600 MHz	9	0.1 Hz, 10 Hz, 100 Hz	$169.95
CT-125	10 Hz–1.25 GHz	< 25mV to 50 MHz < 15 mV to 500 MHz < 100 mV to 1 GHz	9	0.1 Hz, 1 Hz, 10 Hz	$189.95
CT-250	10 Hz–2.5 GHz typically 3.0 GHz	< 25 mV to 50 MHz < 10 mV to 1 GHz < 50 mV to 2.5 GHz	9	0.1 Hz, 1 Hz, 10 Hz	$249.95
PS10B Prescaler	10 MHz–1.5 GHz, divide by 1000	< 50 mV	Convert your existing counter to 1.5 GHz		$89.95

SPEED RADAR $89.95 complete kit SG-7

New low-cost microwave Doppler radar kit "clocks" cars, planes, boats, horses, bikes or any large moving object. Operates at 2.6 GHz with up to 1/4 mile range. LED digital readout displays speed in miles per hour, kilometers per hour or feet per second! Earphone output allows for listening to actual doppler shift. Uses two 1-lb coffee cans for antenna (not included) and runs on 12 VDC. Easy to build—all microwave circuitry is PC stripline. ABS plastic case with speedy graphics for a professional look. A very useful and full-of-fun kit.

BROADBAND PREAMP

Boost those weak signals to your scanner, TV, shortwave radio or frequency counter. Flat 25 dB gain, 1 to 1000 MHz. 3 dB NF. BNC connectors. Runs on 12 VDC or 110 VAC.
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Easy to build power amp has 8 times power gain, 1W in, 8W out, 2W in, 16W out, 5W is for 40W out. Same amp as featured in many ham magazine articles. Complete with all parts, less case and T-R relay.
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TR-1, RF sensed T-R relay kit $11.95

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FM-2, as above but with added mike preamp $7.95
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MC-1, miniature sensitive mike cartridge for FM-1,2,4 ..... $2.95

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A real microwave Doppler sensor that will detect a human as far as 10 feet away. Operates on 1.3 GHz, and is not affected by heat, light, or vibrations. Drives up to 100 mA output, normally open or closed, runs on 12 VDC.
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Complete kit, MM-5 ..... $24.95
Case + knob set, CMM-5 . $12.95

PACKET RADIO

Two new versions are available for the Commodore 64 (P-64A) or the IBM-PC (P-IBM). Easy assembly "NO TUNING". Includes FREE disk software, PC Board and Full Documentation.

KIT	P-64A	$59.95
	P-IBM	$59.95
CASE	CPK	$12.95

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Make that reciever come ALIVE! Small size for easy installation with Hi-Q tuned input for peak performance. Excellent gain and noise figure—guaranteed to improve reception! Specify band: 2M—PR-10, 220 MHz—PR-20, 440 MHz—PR-40.
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Voice activated switch kit provides switched output with current capability up to 100 mA. Can drive relays, lights, LED, or even a tape recorder motor. Runs on 9 VDC.
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Mini-sized with professional performance. Self-powered from phone line, transmits in FM broadcast band up to ¼ mile. Installs easily anywhere on phone line or inside phone!
PB-1 kit $14.95

NEW!

SPEAKER PHONE

Talk on the phone hands-free, great to put in shop or shack, press the button to answer—no actual phone needed. Works same as commercial units. Talk from anywhere in room, phone line powered—no battery needed. Super for family and conference calls or buy two for hands-free intercom! Add our case set for a pro look.
SP-1 ..... $29.95 Case-CSP $12.95

TICKLE STIK

A shocking kit! Blinking LED attracts victims to pick up innocent-looking can—you watch the fun! Ideal for office desks, parties, nosey know-it-alls!
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Transmits audio over infrared beam up to 30'—use simple lenses to go up to ¼ mile! Hum free, uses 30 kHz carrier. Great for wireless earphones or undetectable "bug." Transmitter + receiver set, LB56 . $19.95

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Full-fledged superhet, microvolt sensitivity, IC detector and 10.7 MHz IF. Tunes Std. FM broadcast band as well as large portions on each end. Ideal for "bug" receiver, hobby experiments or even as FM radio!
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A super sensitive amplifier which will pick up a pin drop at 15 feet! Great for monitoring baby's room or as general purpose amplifier. Full 2W rms output. Runs on 6 to 15 volts, uses 8–45 ohm speaker.
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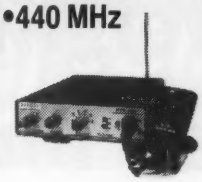
SA-7 kit $14.95

•2 METERS •223 MHz •440 MHz



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Ramsey breaks the price barrier on FM rigs! The FX is ideal for shack, portable or mobile. The wide frequency coverage and programmable repeater splits makes the FX the perfect rig for Amateur, CAP or MARS applications. Packeteers really appreciate the dedicated packet port, "TRUE-FM" signal and almost instant T/R switching. High speed packet? ....No problem. Twelve diode programmed channels, 5W RF output, sensitive dual conversion receiver and proven EASY assembly. Why pay more for a used foreign rig when you can have one AMERICAN MADE (by you) for less. Comes complete less case and speaker mike. Order our matching case and knob set for that pro look.

FX-146 kit (2 Meters)	$149.95
FX-223 kit (1¼ Meters)	$149.95
FX-440 kit (3/4 Meters)	$169.95
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2 MTR & 220 BOOSTER AMP

Here's a great booster for any 2 meter or 220 MHz hand-held unit. These power boosters deliver over 30 watts of output, allowing you to hit the repeater's full quieting while the low noise preamp remarkably improves reception. Ramsey Electronics has sold thousands of 2 meter amp kits, but now we offer completely wired and tested 2 meter, as well as 220 MHz, units. Both have all the features of the high-priced boosters at a fraction of the cost.
PA-10 2 MTR POWER BOOSTER (10 X power gain)
Fully wired & tested $89.95
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Fully wired & tested $89.95

QRP TRANSMITTERS HAM RECEIVERS

20, 30, 40, 80M CW TRANSMITTERS

Join the fun on QRP! Thousands of these mini-rigs have been sold and tons of DX contacts have been made. Imagine working Eastern Europe with a $30 transmitter—that's ham radio at its best! These CW rigs are ideal mates to the receivers at right. They have two-position variable crystal control (one popular QRP XTAL included), one watt output and built-in antenna switch. Runs on 12VDC. Add our matching case and knob set for a handsome finished look.
Your choice of bands $29.95
(Specify band: QRP-20, 30, 40 or 80)
Matching case & knob set, CQRP $12.95

20, 30, 40, 80M All Mode RECEIVERS

Build your own mini ham station. Sensitive all-mode AM, CW, SSB receivers use direct conversion design with NE602 IC as featured in *QST* and ARRL handbooks. Very sensitive varactor tuned over entire band. Plenty of speaker volume. Runs on 9V battery. Very EASY to build, lots of fun and educational—ideal for beginner or old pro. New 30-page manual. Add the case set for well-fitted professional look.
Your choice of bands $29.95
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E-Z KEY CMOS KEYER

Send perfect CW within an hour of receiving this kit! Easy-to-build kit has sidetone oscillator, speed control and keys most any transmitter. Runs for months on a 9V battery. 28-page manual gives ideas on making your own key for extra savings. Add our matching case set for complete station look.
CW-7 kit $24.95
Matching case knob set, CCW $12.95

2, 6, 10 MTR, 220 FM RECEIVERS

Keep an ear on the local repeater gang, monitor the cops, check out the weather or just plain listen around. These sensitive superhet receivers are just the ticket. They tune any 5 MHz portion of the band and have smooth varactor tuning, dual conversion with ceramic IF filters, AFC, adjustabie squelch and plenty of speaker volume. Runs on 9V battery and performance that rivals the big rigs! For a complete finished pro look, add our matching case and knob set with screened graphics.
FM communications receiver kit $29.95
Specify band: FR 146 (2m), FR6 (6m), FR10 (10m), FR-220 (220 MHz)
Matching case & knob set, CFR $12.95

ACTIVE ANTENNA

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AA-7 Kit $24.95
Matching case & knob set, CAA $12.95

SPEECH SCRAMBLER

Communicate in total privacy over phone or radio. Kit features full duplex operation using frequency inversion. Both mike and speaker or line in/out connections. Easy hookup to any radio, and telephone use requires no direct connection! Easy to build 2 IC circuit. Can also be used to descramble many 2-way radio signals. Finish your kit off with the handsome case & knob set.
SS-7 kit $29.95
Matching case & knob set, CSS $12.95

FM STEREO TRANSMITTER

Run your own stereo FM station! Transmit a stable signal in the standard FM broadcast band throughout the house, dorm or neighborhood. Connects easily to line outputs on CD player, tape decks, etc. Runs on 9V battery, has internal whip antenna and external antenna jack. Add our case set for a "station" look!
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SHORTWAVE RECEIVER

Fantastic receiver that captures the world with just a 12" antenna! Can receive any 2 MHz portion from 4–11 MHz. True superhet has smooth varactor tuning, AGC, RF gain control, plenty of speaker volume and runs on a 9V battery. Fascinating Scout, school or club project provides hours of fun for even the most serious DXer. For the car, consider our shortwave converter. Two switchable bands (in 3–22 MHz range), each 1 MHz wide—tunable on your car radio dial. Add some interest to your drive home!
Shortwave receiver kit, SRI $29.95
Shortwave converter kit, SCI $27.95
Matching case set for SRI, CSR $12.95
Matching case set for SCI,CSC $12.95

AIRCRAFT RCVR

Hear exciting aircraft communications—pick up planes up to 100 miles away! Receives 110–136 MHz AM air band, smooth varactor tuning superhet with AGC, ceramic filter, adjustable squelch, excellent sensitivity and lots of speaker volume. Runs on 9V battery. Great for air shows or just hanging around the airport! New 30-page manual details pilot talk, too. Add case set for "pro" look.
AR-1 kit $24.95
Matching case set, CAR $12.95

TERMS: Satisfaction guaranteed. Examine for 10 days. If not pleased return in original form for refund. •Add $3.75 for shipping, handling and insurance. •For foreign orders add 20% for surface mail. •COD (U.S. only), add $5.00. • Orders under $20, add $3.00. •NY residents add 7% sales tax. •90-day parts warranty on kit parts. •1-year parts & labor warranty on wired units.

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CIRCLE 34 ON READER SERVICE CARD

Lightweight, Collapsible Quad for 2 Meters

Excellent performance in a small package.

by Chester S. Bowles AA1EX

New England is blessed with numerous mountains and hiking trails. While our mountains aren't large by Western standards, they are interlaced with roads and trails that make them very accessible—a perfect opportunity for VHF/UHF mountaintopping trips.

I have been a licensed ham since 1967. However, when I purchased my first HT just a few years ago I discovered the pleasure of combining amateur radio with my occasional hikes through the woods. Of course, the elevation makes long-distance contacts easy. As an example, one of my most pleasant contacts occurred during a hike along the Wapack Trail, which has a trailhead just behind my house in Sharon, New Hampshire. Using the Mt. Greylock repeater in western Massachusetts, I had a long conversation with another hiker who was on the Appalachian Trail in Vermont. As we both huffed and puffed along our respective trails, we marveled at the technology that allowed us to communicate so easily across so many miles.

But using HTs on mountaintops presents some technical difficulties. Even using low power and a rubber duck antenna, keying the mike often opened up multiple repeaters. Hearing all those IDs come back was fun, but having any sort of contact was impossible. In addition, I was disrupting communications in multiple locations. The need for a directional antenna was obvious.

I began to think about various portable antenna options. However, my experience with directional antennas is very limited, so I invested $20 in the latest edition of the *ARRL Antenna Handbook*. It was a wise investment. The book is filled with technical information, along with numerous construction ideas. After reading the appropriate sections of the book and talking with some ham friends, my design began to take shape. Construction and tuning, however, turned out to be more difficult than I expected.

I chose to build a quad because of its inherent light weight and because (I thought) no matching would be required. Also, in theory, a two-element quad has more gain than a three-element yagi, making the boom length shorter and therefore more portable. My basic design was good. Construction was simple, the antenna collapsed as expected, and the weight was acceptably low. I quickly discovered, however, that at VHF frequencies the ratio between wire diameter and element length is crucial. Therefore, the formula for determining the length of a quad's driven element (1005/fMHz) did not work. Countless experiments with various gauge wires and element lengths left me no closer to success. I could not get the SWR below 2.8.

As it turned out, the solution was a simple stub-matching network using a trimmer capacitor. With that addition, the antenna matched perfectly, with SWR readings of less than 1.2 across the entire 2 meter band.

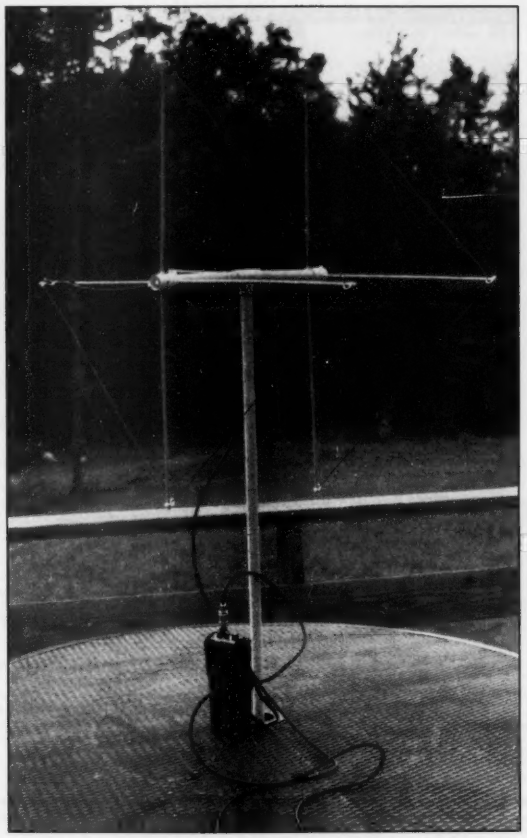

Photo A. The quad shown fully erected. Additional pieces of PVC piping can be added to the mast if more height is needed.

Construction

Construction of the quad is simple and takes very little time. Also, the materials are easy to find and inexpensive.

Start the construction by assembling the boom. The distance between the wire elements is not crucial; any length between 15" and 16" will work just fine. The boom consists of five pieces, as shown in Figure 1. The best approach is to cut two pieces of PVC piping, each about 7" long. Then assemble the boom and measure the distance between the spreader holes. Adjust the length of the boom by cutting off short sections of PVC piping until the total length is correct. Do not glue any of the connections or the antenna will not be collapsible. The parts will stay together by friction.

Next, drill 1/4" holes completely through the boom elements as shown in Figure 1. Note that one set of holes is in the coupling while the other set is in the 3/4" piping itself. This allows the spreaders to be rotated when collapsing the antenna. Drilling holes in PVC is perhaps the most difficult part of the construction. Use a nail or other sharp object to make an appropriate starting point on the PVC. Then, drill carefully, making sure the holes are straight and perpendicular to the PVC. Otherwise, the spreaders will be crooked.

Insert the 1/4" dowels through the holes. I used nylon ties to hold the dowels in place. Do not cut the dowels yet. That will be the last construction detail.

Select one set of wooden spreaders to be used as the reflector element and, using the nylon ties, loosely secure one plastic ring to each of the four spreader ends. Then, loosely secure one plastic ring to three of the spreader ends that will be used as the driven element. The plastic ring is not required on the fourth driven element spreader because

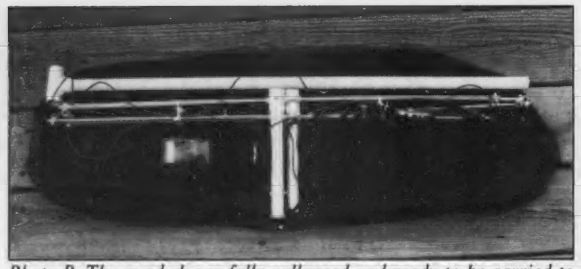

Photo B. The quad shown fully collapsed and ready to be carried to your favorite mountaintop. Note the HT for size comparison.

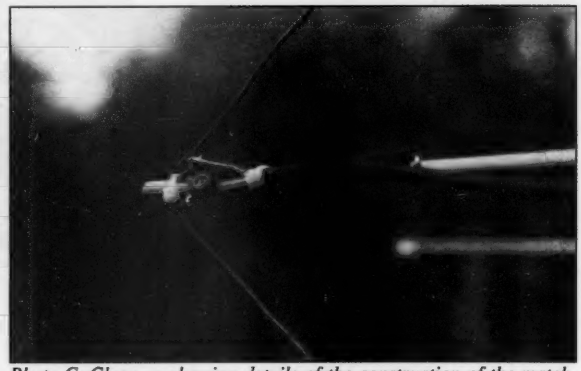

Photo C. Close-up showing details of the construction of the matching network.

the coax feed and the matching network will be installed on that spreader.

Cut the wires for the driven and reflector elements using the 18-gauge hookup wire. The driven element should be 82.5" (209.6 cm). The reflector should be 86.6" (220.0 cm).

Feed the reflector wire through the plastic rings on the reflector spreaders. Then strip about 1/4" of insulation from each end of the wire and solder the two ends together, making a complete loop. Position the plastic loops along the spreaders until you form a tight, perfect square (it helps to measure the distance along each spreader). Finally, tighten the nylon ties securely and cut the tails.

Construction of the driven element is more complex because of the matching network. First, feed the driven element wire through the three plastic rings on the driven element spreaders. Then, using a nylon tie, secure the driven element wires to the fourth spreader, as shown in Figure 2. Assembly and construction details of the matching network are also shown in Figure 2. Use caution when soldering to insure a good connection and to avoid overheating the components. Position the wire into a perfect square and tighten all the nylon ties, cutting the tails. Finally, secure the matching network and coax to the spreader using additional nylon ties.

A 30" piece of PVC piping serves as a short mast. Additional connectors and lengths of piping may be added to extend the mast if desired.

The only remaining construction detail is to trim the wooden spreader elements. Pruning shears work very well, but leave about 1/2" of extra dowel in case future adjustments are necessary.

Adjustments

Signals generated by a quad antenna are polarized. If you want *vertical* polarization, the antenna feed point must be on one of the horizontal spreaders. Conversely, if you want *horizontal* polarization, the antenna feedpoint must be on either the top or bottom spreader. The design of this quad allows the polarization to be changed easily—just twist the spreader elements 90 degrees.

Antenna matching is accomplished using an SWR bridge and tuning the trimmer capacitor to achieve the best reading.

To collapse the antenna, pull the PVC piping out of the "T" connector. Then, while holding the wooden spreader elements, twist the PVC piping and connector 90 degrees. The spreader elements will then line up in a package about 30 inches long. Of course, the wire elements will hang loosely at this point, but they will stretch back into shape when the antenna is reassembled.

I tested the antenna on several recent hikes. One hike took me up Mt. Monadnock in southern New Hampshire, and the second up Mt. Aziscoos in northwest Maine. Performance was as good as expected. The antenna fit easily into a long, narrow bag that I could wear like a backpack. Assembly was easy and quick, taking less than two minutes. And, best of all, the signal reports were outstanding. Using less than 1/2 watt, I was easily able to work repeaters 60-70 miles away with full quieting. Using 3 watts yielded similar signal reports on repeaters more than 100 miles away. Simplex was fun, too. The gain and directivity allowed me to block side signals quite well and to work selected stations with ease.

A note of caution: This antenna was designed to be very lightweight and portable. As a result, it is fragile. The 1/4" dowels can easily be broken, so use care when handling the antenna. Also, the antenna was designed to be used in fair weather. The capacitor and the wooden spreaders should not be exposed to rain or moisture. A light coat of spray lacquer or silicone sealant would afford some protection. Finally, the capacitor can be bumped easily, causing the setting to change. A drop or two of clear fingernail polish will "cement" the capacitor at the proper setting.

Those cautions aside, the antenna performs extremely well and is easily carried on hikes or climbs. I'm sure it will afford much pleasure on your mountaintopping expeditions.

PARTS LIST

1	3/4" PVC pipe, 10 ft. long
2	Couplers for 3/4" PVC pipe
1	"T" connector for 3/4" PVC
4	1/4" x 36" wooden dowels (for the spreaders)
1	Package nylon ties
7	1/2" plastic rings (available at craft stores)
20'	18-gauge hookup wire
6"	300 ohm TV twin lead
1	Trimmer capacitor 6-50 pF (Radio Shack # 272-1340)
Coax and connectors	

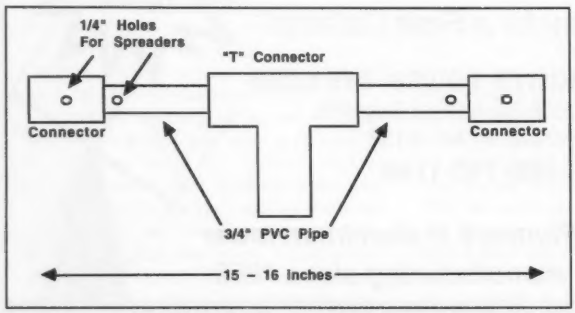

Figure 1. Boom construction.

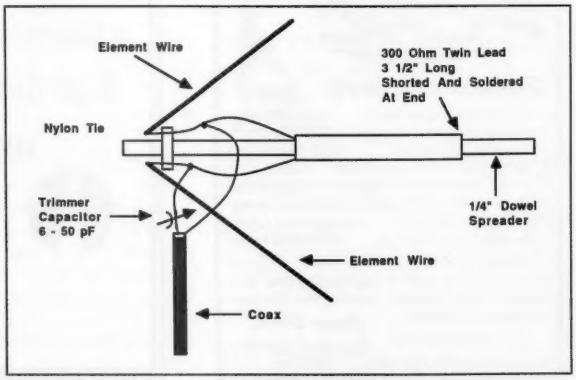

Figure 2. Detail of matching network.

Want A Dish?

Building your own is easier than you think.

by Ralph E. Herzler WA8WBP

A homemade dish does not need to be a mathematical nightmare. The literature is full of complicated formulae that supposedly tell you how to construct the dish of your dreams. You need not be a rocket scientist to cut through all of this mish-mash. Allow me to take you step-by-step through the process.

Calculations and Construction

The usual first decision in designing a dish is to establish the desired diameter. The larger the diameter, the greater the gain of a dish antenna system. Most of us are limited by physical or other constraints to a maximum diameter. In my case, the space available on the rotating bar of my satellite antenna system limited me to a four-foot dish. Since some of my QSOs involved hams using a dish of this size on the frequencies that I wanted (1269 and 2400 MHz), I was encouraged to proceed.

After you determine a suitable diameter, the next choice is the f/D ratio, where f is the focal length of the dish and D is the diameter already determined. The focal length is the distance from the deepest part of the dish to the closest end of the feed system. Feed systems may be of several kinds and are another subject. Suffice that the recommended f/D ratios for amateur work are between 0.4 and 0.6. I chose 0.5, which gave me a focal length of 24 inches.

Knowing the focal length and diameter makes it possible to determine the depth of the dish. The only formula necessary is: $d = D^2/16f$, where d is the dish depth, D is the dish diameter, and f is the focal length, all expressed in inches. Thus, my four-foot dish with a focal length of 24 inches would be $48^2/16 \times 24 = 6$ inches. that is all there is to the math!

With guidance from Bob Douglas W5GEL, I built a dish based on these dimensions and similar to the construction project by Keith Berglund WB5ZDP published in the May 1989 issue of *73 Amateur Radio Today* ("Inexpensive Mode-L Dish Antenna"). Instead of using a formula to establish the paraboloid, I simply laid out a scale on 1/2" plywood marking 1" points from zero to six in one direction and 4" points from zero to 24 (the dish radius) in the other direction. Draw lines from the zero-zero point to each of the six 1" points. By joining the intersection of these lines and the six 4" points on the other axis, the contour of half the dish was established. See Figure 1.

Sawing this contour from the marked plywood will produce an excellent bending fixture, as shown in Photo A. I chose to use aluminum channel for the ribs and found it, called "half-inch plywood channel," at a local distributor. When one end is clamped to the fixture, you can easily shape the channel to the fixture by using a rubber mallet. There is some springback to the formed piece, which I corrected by hand. If I were to do this again, I would deepen the curvature of the fixture enough to compensate for the springback. However, hand correction is accurate enough for this frequency range and below. Higher frequency operation might be a bit more fussy.

In my application, I felt it desirable to build a lighter unit than that described in Keith Berglund's article, while maintaining his excellent methods of attaching the ribs to a hub and providing means to attach the 1" and 3/4" sections of pipe for counterbalance and feed support, respectively. The counterbalance, in my case, is a 24" length of pipe coupled to the mounting flange with a pipe tee. The tee's purpose is to introduce coax and other wiring through a length of 3/4" PVC pipe and carry it to the feed device. The length of PVC pipe is such that the hot end of the feed device is at the focal point, in my case 24". Each end of the PVC pipe is threaded with an extra-long thread to provide for adjustment to the focal length. By using this method of supporting the dish feed, I was successful in avoiding additional feed supports. However, be prepared for your hardware man to doubt your sanity when you ask him to thread PVC pipe, since it is usually glued.

In a further effort to keep weight at a minimum, I cut pie-shaped sections of 1/4" mesh hardware cloth to fit the rib assembly so that the factory-finished edge forms the outer edge

Photo A. Plywood bending fixture.

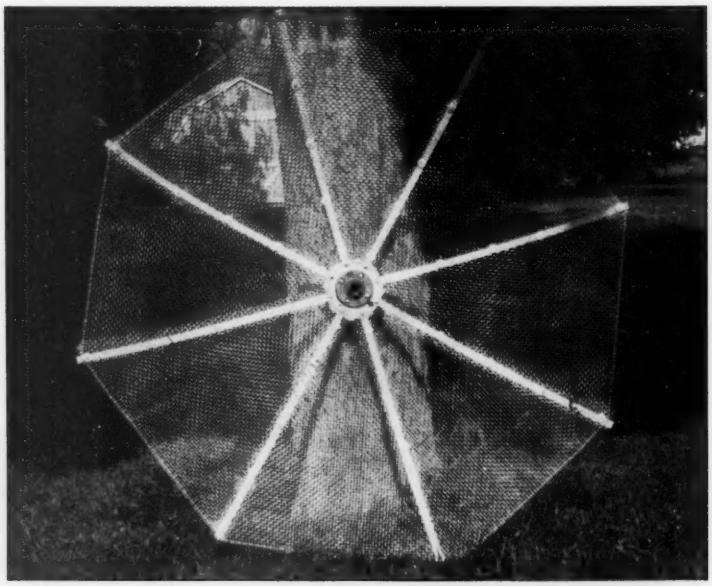

Photo B. Hardware cloth mesh attached to ribs.

of the dish. Note that these sections may be cut alternately up and down from 24" hardware cloth to minimize material usage. The sections were cut wide enough to overlap at the ribs and attached with #6 sheet metal screws and fender washers. No peripheral stiffening is necessary because the finished edge is sufficient support. This method of applying the mesh also avoids many cuts and scratches. Photo B shows the rib assembly with the mesh applied to the ribs.

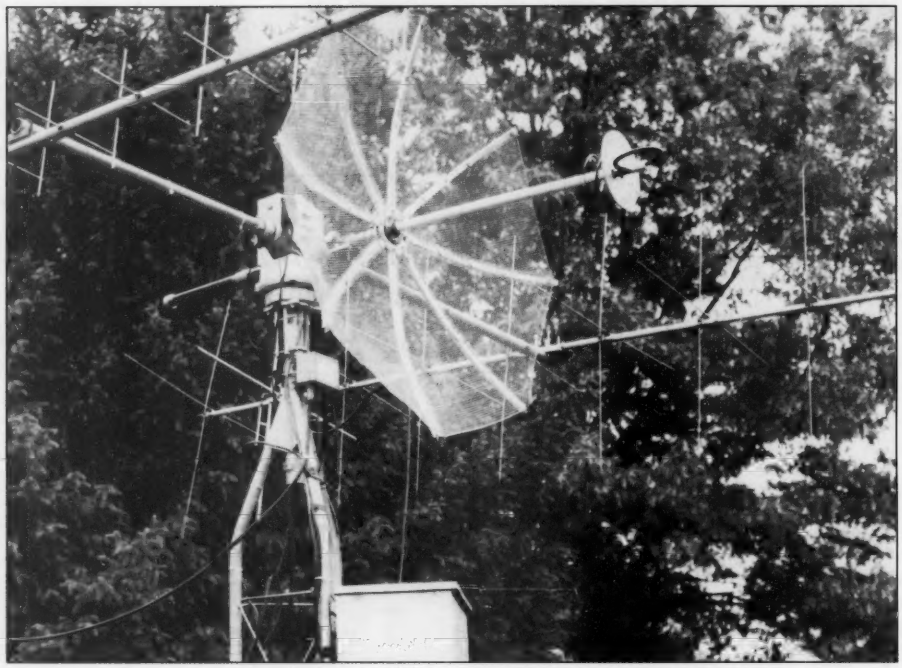

Photo C. Completed dish in place on the rotating bar.

The Feed System

In choosing a feed system for this dish, I was confused by the complexity of the "feed horn" approach and could not visualize how both 2.4 GHz and 1269 MHz could function in the same enclosure. The adjustment looked tricky, and having the extra coax required for matching at 2.4 GHz bothered me. Having built several helix antennas, I thought that two concentric helices might be possible. It certainly would simplify aiming, compared to mounting two separate feeds off-center but on the same backplate. In fact, because Mode S aiming is so critical, skewing the receive antenna to compensate for off-center mounting would move the 70 cm antenna completely out of alignment. The concentric approach seemed the only way to go. Boy, did that raise some questions!

Would two helices mounted concentrically interact? With the 2.4 GHz helix being very close to a second harmonic of the 1269 helix, would it pick up enough RF to destroy the 2.4 GHz GaAsFET preamp when Mode L was being used? (I have nearly 50 watts in that Mode and it would be within 3/4" of the smaller helix.) Since I planned to run my coax and power wiring through the support pipe for the feed, would that interact with the feed system? These were questions that I could not find answers for. I could only try the system for real answers and, happily, all were favorable. No doubt I will be challenged from some corner, but the proof is that the system works.

The performance of this antenna system exceeded my most optimistic expectations. I am able to clearly hear Mode S signals that were down in the noise before, and my own signal on Mode L is much stronger than it was when I used a pair of 13-turn helix antennas. The finished dish, in place, is shown in Photo C. The construction of the feed is quite simple, as shown in the step-by step photos. Photo D is the 7" diameter backplate with the coax fittings in place. Two 9/16" holes, appropriately located on the periphery of the helix coils, were drilled to mount Type N connectors, and two other holes were drilled to secure the center tubing. The large hole was cut with a hole saw in a drill press; the others, simply drilled. The coax fittings were mounted with 4-40 bolts into tapped holes. The tubing support holes were tapped for 6-32 hardware.

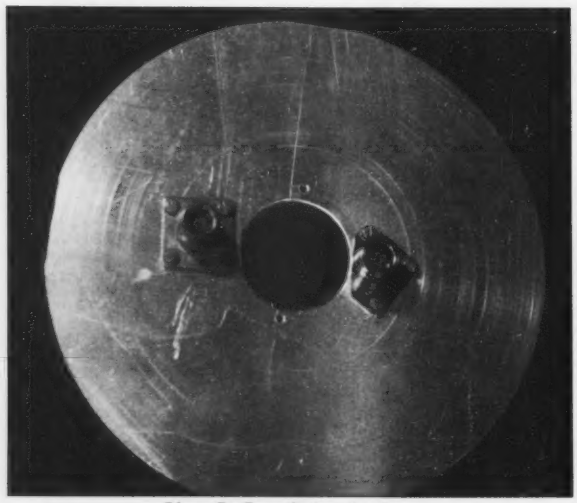

Photo D. Coax fittings in place.

The center support tubing is a 6" long, 1-1/2" diameter PVC tailpiece standard plumbing fitting cut to 3-1/2" long, leaving the flange for securement. I coated the flanged end with PVC cement, inserted it in the 1-1/2" hole and secured it in place with two 6-32 bolts and washers.

The 2.4 GHz helix is three turns of #14 wire wound as a left-hand thread on the center support. I secured the lower end by carefully soldering it to the innermost type N fitting, wound it with 1" spacing between turns, and secured it at the outer end by bending it inward through a small hole drilled for that purpose. Photo E shows the helix mounted to the tubing. A small piece of brass shim stock is soldered to the coil near the backplate for impedance matching. A 3/4" PVC pipe thread to cement joint adapter is inserted in the support tubing. There is a stop in this fitting to keep the unthreaded pipe from entering the adapter too far. I removed this stop with a 1" drill and then cemented the adapter in the outer end of the 1-1/2" tubing, threaded end out. This is the support for the entire feed system. You now have a 2.4 GHz helix feed!

The 1269 MHz helix consists of two turns of 1/4" copper tubing. I wound this also as a left-hand thread, three inches inside diameter, spaced 2" between turns. One end was drilled to slip over the pin of the coax fitting and then the coil was carefully soldered in place. I used a piece of Lucite 1-1/2" i.d. and 3" o.d. to support the outer end of the 1269 helix. After drilling a small hole in the Lucite, I tied it with several turns of plastic fishing line.

Continued on page 35

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Continued from page 8

Committee asked the Digital Committee to look into the issue. A meeting was held between the Digital Committee and representatives of the HF packet community in late September 1992.

(11.) A meeting of the IARU Region 2 General Assembly (held in Curacao, Netherlands Antilles) just before the September 26th meeting between the Digital Committee and HF packet enthusiasts produced another—substantially revised—HF band plan—including segments for automatically controlled data communications.

(12.) The new IARU band plan provides segments on each amateur HF band for digital modes including RTTY, AMTOR, packet—defined as including new systems such as Clover and Pactor—but excluding facsimile and SSTV. CW would continue to be permitted throughout all amateur bands.

(13.) The League now recommends that:

(a.) Amateur stations may be operated under automatic control using any accepted protocol for data transmissions within certain small frequency segments;

(b.) Such stations should be equipped with a means to limit transmissions to no more than five minutes in the event of an equipment malfunction or interruption of contact with another station;

(c.) Third party communications may be transmitted under automatic control, using any authorized emission mode [Baudot, AMTOR, ASCII] provided that the retransmitted messages originate at a station that is being locally or remotely controlled;

(d.) HF data operation should be permitted outside those specified subbands only under local control;

(e.) The rule which prohibits automatic control while transmitting third party traffic (except packet stations using the AX.25 protocol on the 6 meter and shorter wavelength bands) should be changed so as to permit RTTY and other modes under automatic control on HF frequencies as well as at VHF and above.

The ARRL recommends the following new Part 97 wording:

Section 97.109 Station Control.

(d.) When a station is being automatically controlled, the control operator need not be at the control point. Only stations transmitting RTTY or data emissions, and stations specifically designated elsewhere in this Part, may be automatically controlled. Automatic control must cease upon modification by an EIC (Engineer-In-Charge) that the station is transmitting improperly or causing harmful interference to other stations. Automatic Control must not be resumed without prior approval of the EIC. RTTY and data stations operating under automatic control on frequencies below 50 MHz must use a digital code permitted in 97.309(a) [Baudot, AMTOR or ASCII] of these Rules, and must incorporate provisions for discontinuing transmitter operation in the event of malfunction, or interruption of communications with another station.

(1.) Stations transmitting RTTY or data may be operated under automatic control in the 6 meter and shorter wavelength bands: 28.120-28.189 MHz; 24.925-24.930 MHz; 21.090-21.100 MHz; 18.105-18.110 MHz; 14.094-14.0995 MHz; 14.1005-14.112 MHz; 10.140-10.150 MHz; 7.100-7.105 MHz; or 3.620-3.635 MHz.

(2.) Stations authorized by these rules to transmit RTTY or data communications under automatic control may transmit third party communications. Any retransmitted messages on behalf of any third party must originate at a station that is under local or remote control. *TNX W5YI Report, Vol. 15, Issue #4, February 15, 1993.*

Newcomers Grow by Another 5% in 1992 . . . Versus a 54% Increase in 1991

The final licensing statistics are in! Nearly 75% of all first-time ham operators chose the Code-Free Technician path into amateur radio during 1992. The Novice class continues to decline with 38% less beginners choosing this route than a year ago.

The number of beginners leaped by 53.8% in 1991 due to the establishment of no-code hamming. In 1992, there was a slight increase: 4.0% (44,748 vs. 42,660). *TNX W5YI Report, Vol. 15, Issue #4, February 15, 1993.*

Canadian No-Code

The Basic No-Code ham ticket came to Canada in late 1990. It was responsible for a 5.3% growth rate that year and another 10% in 1991. 1992's figures show an increase of 20% over 1991 through the third quarter! There are now about 35,000 ham licensees in Canada. (By comparison, there are 90,000 licensed hams in California alone!) Amateur license fees in Canada were also increased to $23 this year. *TNX W5YI Report, Vol. 15, Issue #3, February 1, 1993.*

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. . . to all our contributors! You can reach us by phone at (603) 924-0058, or by mail at *73 Magazine*, Route 202 North, Peterborough NH 03458. Or get in touch with us on CompuServe ppn 70310,775; MCI Mail "WGEPUB"; or the 73 BBS at (603) 924-9343 (300-2400 bps), 8 data bits, no parity, one stop bit. News items that don't make it into *73* are often put in our other monthly publication, *Radio Fun.* You can also send news items by FAX at (603) 924-9327.

Want A Dish?

Continued from page 32

The two helices should be tuned for minimum VSWR on their respective frequencies. This is done by bending the small brass strips closer to, or further from, the backplate, measuring as you go. The finished two frequency helix feed and the brass impedance matching strips are shown in Photo F. I am fortunate in having a Bird wattmeter and slug for the 1269 MHz frequency for this purpose. I had no equipment to adjust the 2.4 GHz helix. However, since this is a receive only frequency on OSCAR 13, it is not as critical as the 1269 adjustment.

I did not include any kind of isolation of the 2.4 GHz (SSB UEK 13) converter to protect it from the 1269 MHz RF. This was a gamble that I took after discussing it with Gerald Rodski, SSB's US representative. Jerry thought that this unit was tuned tightly enough to exclude the 1269 RF. While I was able to get by without protection for the Mode S converter, a more conservative approach would isolate it from the Mode L helix by a suitable RF relay.

I am grateful to Bob Douglas W5GEL for his encouragement and counsel on my project and to Keith Berglund WB5ZDP, whom I have never met, for his excellent mechanical design. Other data was gathered from the *RSGB VHF/UHF Manual*, the *ARRL Handbook*, and heaven knows how many other references. I hope that this concept may encourage others.

Note: A kit of formed, and drilled parts ready for assembly is available for both the dish and the feed from *Majara Corporation, 408 Liberty Rd., Sturgis MI 49091; (616) 651-6394.*

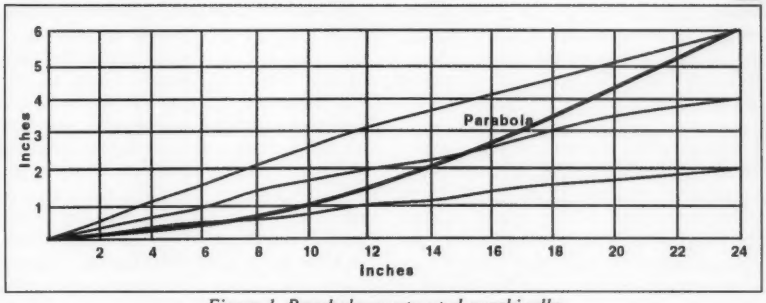

Figure 1. Parabola constructed graphically.

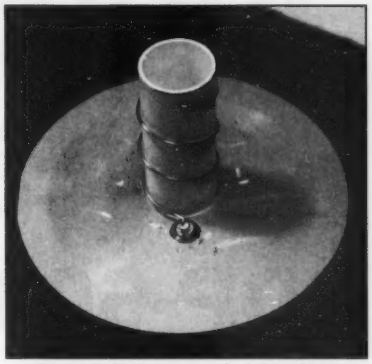

Photo E. Helix mounted to the tubing.

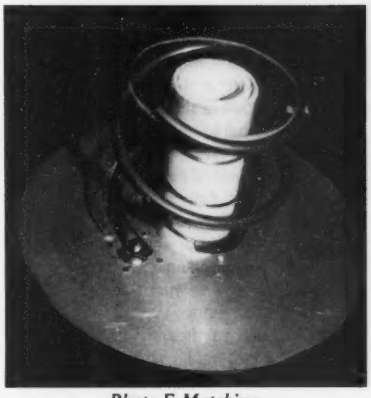

Photo F. Matching.

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The j•Com Zetel SDP-600 Smart Patch

Most hams, at some point in their development, dream of having an autopatch. In the old days, before there was a repeater on every hilltop, hams saved up their money to put an autopatch on the local repeater. Nowadays, hams dream of having a patch on their base at home so they *won't* have to use the local repeater. At any rate, the convenience of being able to make a call from the car, or even the drama of being able to phone in an auto accident, provide the material for a great many ham daydreams.

As with most daydreams, things go pretty well until the first "reality check." In this case, the balloon pops at the point where the hero reaches for his checkbook. Autopatches aren't cheap. The basic home-brew variety is cheap enough—but you need your own repeater to use one. Any patch smart enough to be used with a simplex base station has a big enough price tag to scare off the most imaginative daydreamers—until now.

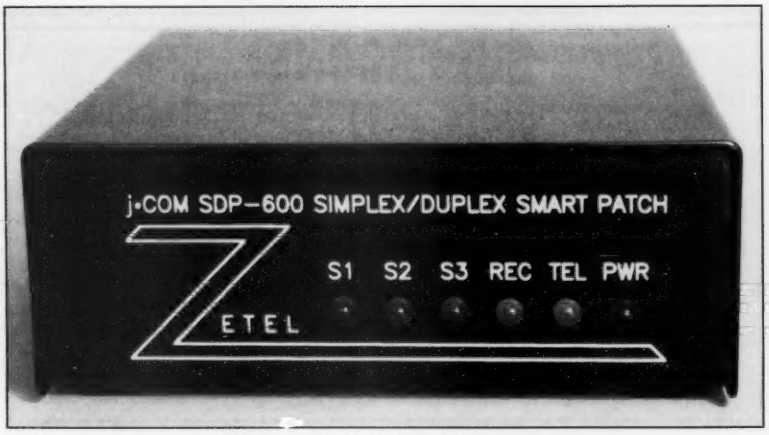
The j•Com Zetel SDP-600 Personal Autopatch may not answer all of your dreams, but it will certainly take care of your autopatch problems—at a reasonable price. The key word here is "Personal." The SDP-600 is designed for the basic needs of the home user. It provides all of the basic autopatch functions, plus the intelligence to perform simplex sampling, for just under two hundred dollars. In addition, a few "frosting on the cake" features are thrown in as well.

Autopatch Operation

In order to understand the operation of the SDP-600, it may help to review basic autopatch operation. As an example, an electronic phone patch has to perform the exact same functions as that stateside ham running phone patches on 20 meters for those servicemen overseas. First, the ham must establish contact with the ham on the other end. She then takes the phone off hook and dials the number. Once the situation is explained to the stateside callee, the conversation begins. During the conversation, the stateside ham must perform VOX (voice operated relay) functions. In other words, she must wait until one party is done talking, and then switch her transceiver into the other mode until the other person finishes speaking, etc., etc., etc. (On "non-auto" patches, the parties on both end of the conversation will agree on a key word that lets the ham know when she should flip the switch. You know, something like "I love you, honey. OVER.") Once the conversation is over, she needs to hang up the phone. If she's a good operator, she'll even ID her station.

Those are the bare minimum functions required to perform a phone patch, whether on 20 meters or 2 meters. Operation of an automatic phone patch is very similar. Consider the Personal Autopatch installed on a simplex base station at our own home. Once we are within range of our house, we take the phone off the hook by dialing an access code, and the "★" sign. The SDP-600 responds with a short burst of dial tone. We dial our number, followed by another "★" The SDP-600 gives us a confirmation beep, and REDIALS the number on the telephone line. When the called party answers, their voice triggers the VOX circuit in the Autopatch, and keys up the base transmitter until they stop talking. The mobile can then key his transmitter, which allows him to talk to the called party. This VOX operation keeps up until the conversation is finished. At this point, the mobile operator dials a "#," which hangs up the phone, completing the call.

In an ideal world, this type of simplex autopatch would work pretty well. In reality, some modifications to the system need to be made since we're connecting a simplex system (the radios) to a duplex system (the telephone). Simplex autopatches usually fall into two categories. The main problem to be circumvented is that of dealing with a simplex mobile and base—two radios that can't talk and listen at the same time. One way to get around this problem is called "sampling." A sampling autopatch puts the base station into transmit at the same time the phone comes off hook, transmitting the phone line audio to the mobile user. In order to tell if the mobile ever transmits, the patch simply "samples" the receive channel by momentarily changing from transmit to receive. This sample might occur for a quarter of a second, and repeat every two seconds or so. If the base hears the mobile during the sampling period—by detecting carrier, subaudible tone, or audio, depending on the system—it discontinues the transmit/sample mode and goes into receive. It will stay in receive, passing the mobile audio down the phone line, until the mobile's carrier drops. The base will then go back into transmit/sample, and the landline audio will be transmitted to the mobile. This is an effective system, and it keeps the mobile operator firm-



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ly in control of the base station, since he can transmit a turn-off code at any sample interval—a couple of seconds at most. Unfortunately, the sampling cuts "holes" in the landline audio, making it difficult to understand under marginal conditions. In addition, the rapid transmit-receive transitions of sampling systems are best suited for newer radios without relays—and radios that don't mind the heavier duty cycle.

The second type of simplex system is called "cross lockout VOX." This system uses VOX circuits to key the base transmitter, based on the landline caller's audio, and to keep the base in receive when the mobile is transmitting. As long as either party continues speaking, they will have control of the system—the other party can't interrupt (he is effectively "locked out"). The VOX system provides for a more natural flow of conversation, and makes for more readable copy under marginal conditions. Its main drawback comes from the fact that the mobile operator has to wait until the landline caller has finished speaking before he can interrupt or send commands to disconnect the patch. This has interesting social and legal implications. As an example, this means that if your pal launches off on the five minute story of how he caught that big bass last week, forgetting that he told you the same story this morning, there isn't a thing you can do about it until the five minute story is over. Likewise, if the person you're talking to notices a pot boiling over on the stove and rushes off, putting the phone down next to the stereo speaker with that Andrew Dice Clay album on—well, we're in trouble here. More likely is the problem of the mobile operator getting used to the need for the base carrier to drop before he tries to send commands to the autopatch. This means that if you transmit your phone number while the base is sending you dial tone (no big deal—I do this on the telephone all the time) the base won't hear the DTMF tones, and you'll get a wrong number. Once you do get the wrong number, it will probably be one of those almost endless recordings from the phone company which will keep the VOX keyed for a full minute, only dropping for a millisecond just as you're going through heavy traffic.

As in life, the best answer is usually a compromise. The folks at j•Com have produced a VOX autopatch with an intermittent sampling feature. It works as a normal VOX system, except that it samples right after the landline caller takes control of the VOX, and every 20 seconds thereafter. Each sample is preceded by a beep tone to let you know that it's coming. In other words, you get the smooth flow of a VOX system, plus the ability to jump in and wrench control of your base station away from your foul-mouthed friends. What could be simpler?

Well, as long as you asked, duplex. In a duplex system, where both the transmitter and receiver are active in both the mobile and the base, the mobile can send tones any time he needs to. People can interrupt and be heard. In those cases where you might not have a duplex mobile, the mode is known as half-duplex. The repeater is still duplex, and transmits the landline audio as long as the patch takes the phone off hook. The simplex mobile still pushes to talk, and listens when he's not talking. (If you've made a phone patch on the local repeater using your HT, you've made a half-duplex patch.) With the proliferation of dual-band mobiles and bases around, personal full-duplex autopatches are becoming very realistic. This would give you the same feel as an actual cellular phone conversation—but due to the Rules and Regs, you just couldn't talk about anything interesting or important! In any case, the SDP-600 can handle all of these modes—the limiting factor is your radio.

Extra Functions

In addition to these basic features that make for a workable phone patch, the SDP-600 has a few more functions that make life easier. DTMF tones from the mobile are received, decoded, and re-generated before being passed to the phone line, in order to ensure noise-free tones at the central office. An access code of up to four digits can be used to prevent unauthorized use of the patch. A second access code can be set to allow general use of the patch, but to restrict toll calls to authorized operators. (If you're the trusting type, these codes can be programmed out—that is, the unit will work the same as our basic patch described above.) A reverse patch function allows the patch to pick up the line when the phone rings, and send a ring tone out to the mobile. A CW ID function lets the user program in his callsign, which will then be transmitted at the beginning and end of each conversation. Timeout features are incorporated as well. If you drive out of range of your base station, the Personal Autopatch will disconnect after 30 seconds of no activity. A feature with a lot of potential is the "control output." This is simply an open collector transistor that is brought out to the rear connector. It's activated with an Access Code + "1" command from the mobile. This output can be hooked up to a relay, which can then control anything you desire. You might want to use it to enable or disable another radio at the site, or to reset that troublesome TNC. Less serious types will want to turn on the yard light before they pull into the driveway, or turn on the coffee maker when they're five miles from home.

Hook up and installation of the Personal Autopatch is very straightforward. It's designed to use the mike connector levels of the average rig—mike level audio out, and speaker level audio in. (This means there's no need to dig through the radio to find detector audio.) Ground and PTT are also needed. There are four potentiometers in the unit to adjust in the event of unusual phone or radio levels, but these are pre-set at the factory for average levels. (The review unit worked fine right out of the box, even considering the lousy phone system here in the New Hampshire boondocks.) The hardest part of the whole installation will be soldering the four-conductor interconnect cable without burning your fingers.

"If you're looking for a well-built, full-featured basic autopatch for home or repeater use, at a price that won't break the bank, the j•Com Zetel SDP-600 could be just the ticket."

Wish List

The only drawbacks I found with the SDP-600 were of the "wish list" variety, not actual problems. For instance, the LEDs on the front panel indicate radio audio, phone line audio, power, and three status points, labeled S1, S2, and S3. These three status LEDs change configuration as the patch performs various functions, but it's difficult to intuit what the various combinations mean. Examples are given in the manual, but a series of more meaningful indicators (OFF-HOOK, ACCESS CODE RECEIVED, PROGRAMMING MODE) would be very helpful, especially during installation and troubleshooting. There is no battery backup in the unit, so any parameter programming is lost in the event of a power failure. The unit does revert to a usable set of parameters, including the firmware-based main access code, but a small back-up battery or a non-volatile memory arrangement would be a nice feature. (I know, I know—I want Cadillac features at a Chevy price—but it doesn't hurt to ask!) *[Ed. Note: Beginning March 1, 1993, j•Com will be shipping units which include a non-volatile memory. In the event of a power failure or when not using the unit for long periods of time, these units will retain the codes entered. Customers who purchased the original units should contact j•Com if they wish to have the upgrade added to their existing units. The cost of upgrading has not been determined at this time, but is expected to be under $40. No change in the price of the phone patch is expected.]*

In the event of a problem that the manual can't answer, the technicians at j•Com are both competent and friendly. My question concerning receiver carrier detect was answered quite promptly. If worse comes to worse, the unit is covered by a 90-day parts and labor guarantee, and a 30-day money-back-if-not-satisfied guarantee.

The j•Com Personal Autopatch doesn't do two-tone paging, doesn't have a voice mailbox system, and won't do multiple RF link control. It also doesn't cost two thousand bucks. If you're looking for a well-built, full-featured basic autopatch for home or repeater use, at a price that won't break the bank, the j•Com Zetel SDP-600 could be just the ticket. 73

UPDATES

Active Antenna Using a MOSFET

Refer to the above article on page 32 of the March 1993 issue. While the parts placement diagram is correct, we printed the PC board pattern in reverse. The correct PC board pattern is shown in Figure 1.

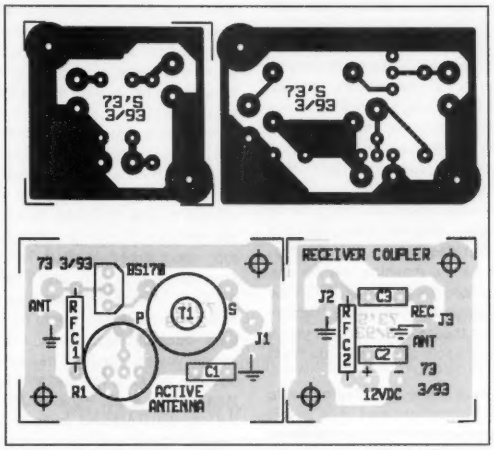

Figure 1. Corrected parts placement diagram for the Active Antenna.

Computer Control for the Ramsey FTR-146

Refer to the above article on page 60 of the March 1993 issue. Same deal as above, folks. We printed the PC board pattern backwards. The correct, right-side-up pattern is shown in Figure 2.

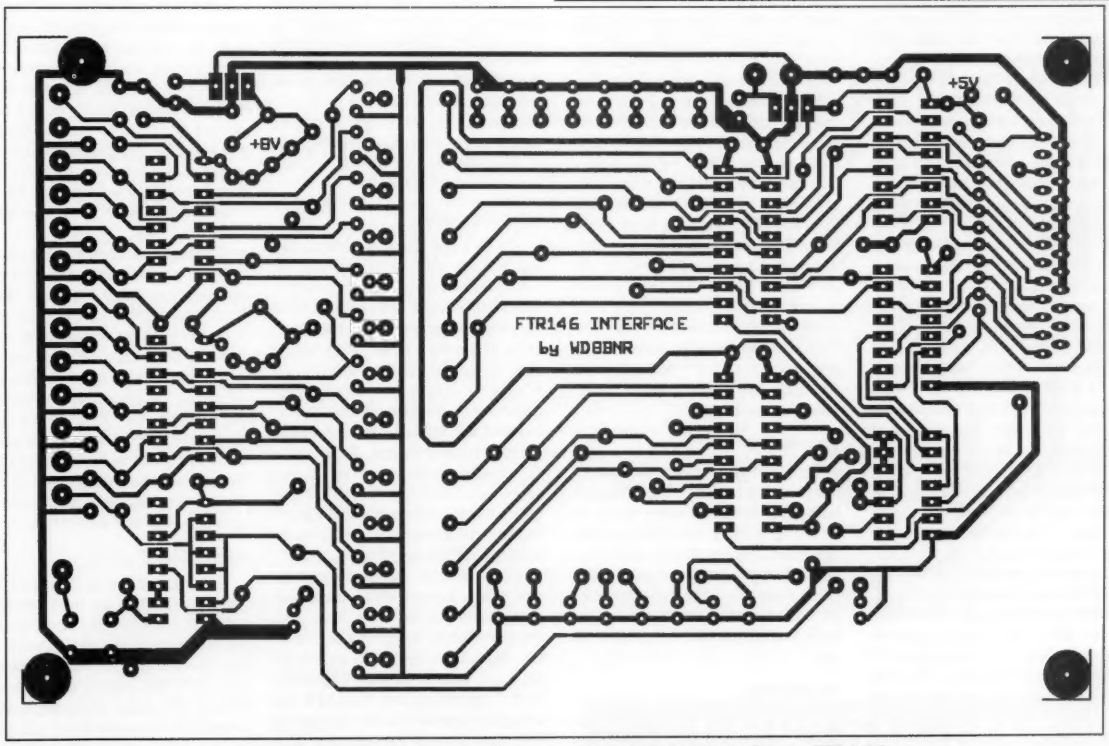

Figure 2. Corrected parts placement diagram for "Computer Control for the Ramsey FTR-146."

PACKET & COMPUTERS

Jeffrey Sloman N1EWO
P.O. Box 636
Franklin IN 46131

Quiet Down Your Shack, Part 1

Answers to the survey that first appeared in this column a few months ago continue to come in, but one thing is already clear: Two answers top the list of problems encountered by hams. The first one—and the subject of this column—is RFI (Radio Frequency Interference) caused by all the computerized equipment that we put in our shacks today. For help with the second most common reply, "not enough money to buy gear," see "Never Say Die" in this and previous issues of *73*.

How Many Transmitters?

When you count the transmitters in your shack, do you stop at the radios? Well, even if they are not supposed to, computers and their associated peripherals can put out a pretty good signal. Sometimes there is nothing you can do about the interference. Usually, a few simple techniques will greatly reduce—if not eliminate—the noise.

Before we try to get rid of it, let's take a look at where the noise comes from. Microprocessors are used in just about all consumer electronics today. They control your VCR, clock radio, microwave oven, and even some telephones. Microprocessors are sequential devices—they perform one very simple step after another. They are driven along the way by a "clock." The job of the clock is to regulate the stepping of the processor. This clock is usually a crystal oscillator, a lot like the circuit used in a rockbound rig. One difference, though, is the output waveform. While in radio design we strive for a clean sine-wave output from an oscillator, processor clock circuits are designed for square-wave output. This is a requirement; you can think of each clock pulse as the throwing of a switch. The processor and its support circuitry want nice, snappy switch throwing with definite "on" and "off" states. The sine wave just doesn't fit the bill.

From the RFI point of view, only a sawtooth wave could be a worse choice. The square wave has lots of harmonics. This means that not only does a square-wave generator produce a signal at the intended frequency, but at odd multiples of it as well. These signals can be big. For example, the third harmonic of a square wave is about a third of the power of the fundamental frequency. The fifth is .200, the seventh .143, and it goes on like that. This may not sound like a lot of power, but remember two things: The first is the inverse square law. This says that the signal strength from any source decreases at a rate equal to the square of the distance you are from it. Your computers are in your shack—pretty close, huh?

As computers have become more advanced, their clock rates have gone up. While five years ago a fast machine had a clock rate of 10 MHz, today's fast machine runs at 50. I know from your survey responses that many of you are running 33 MHz machines in your shack. On the other hand, it is often an older machine that is pressed into amateur service. These machines, with their slower clocks, can be a real annoyance to the HF aficionado. The clocks in these machines range from about 4 to 8 MHz, with 6 MHz very common, thanks to the original IBM AT design. You can see that the harmonic products of these machines fall in various places in the HF bands. The oscillators in computers are always run at twice the desired clock rate and then divided by two. This means that a 6 MHz machine has a 12 MHz oscillator.

Other devices that use microprocessors can often be more troublesome than the computer itself. This is because these devices use slower clocks—1 or 2 MHz—which make even more noise at HF frequencies. VHF and UHF users are not immune to this problem, though. For example, when I first purchased my Heath HK-21 "Pocket Packet" TNC, the oscillator in it put out a full quieting signal into the handheld to which it was connected at the incredibly inconvenient frequency of 145.010 MHz. You will recognize this as the primary packet frequency for the US.

What to Do?

Now that you have some idea of the principal culprit in this situation, let's take a look at some steps to clear it up. Keep in mind that your first defense is good station practice. Sometimes the only solution is to buy better equipment of one sort or another, but according to the survey results, this isn't a solution for many of you.

Pay the Price

The FCC has requirements that cover microcomputers and the garbage that they generate. If you have a machine that you purchased for home use, it must be certified under part 15 regulations for radio emissions. This will be the case if you purchase an IBM, Packard Bell, Gateway 2000, Apple . . . you get the idea. This may not be the case (probably isn't) if you purchase a clone machine from a local builder. Even though these machines should be certified, they are most often not. This doesn't mean that all local clone shops build noisy machines. The lack of certification is usually due to the lack of financial resources—lots of money!—needed to get certification. The upshot is this: If you are looking to buy a machine, consider paying more for a machine you know will be quiet. If you plan on buying from a clone dealer, spring for the better case—this will provide better shielding. Bring a portable receiver with you (one that operates where you plan to) and check the machine out. No machine is completely quiet, and they all have certain peak output frequencies, but the receiver will tell you if the noisy spots are where you need quiet.

Another place that paying extra buys something is in the cables that run from the computer to its peripherals. Cheaper cables often have poor shielding, which makes them into radiators of all sorts of junk. Though we have been discussing the microprocessor's clock, there are others on the peripheral controllers that connect to those cables, just waiting to QRM your favorite frequency.

"No machine is completely quiet, and they all have certain peak output frequencies, but the receiver will tell you if the noisy spots are where you need quiet."

What is Shielding?

We all know about shielded cable and that it is resistant to interference, but how does it work? The principle behind shielding is the same as for a Faraday cage, named for British scientist Michael Faraday (1791-1867), who discovered that if he constructed a cage of conductive material and *grounded* it—in England they "earth" it—there would be no electro-magnetic fields inside the cage. Today, classic Faraday cages made of copper screen are used in applications like EMP (Electro-Magnetic Pulse)-proof rooms, laboratories with instruments sensitive to EMF, and the like.

In the case of cables, computers, and radios, the shielded jackets and cases keep out the noise. But, note the requirement to *ground* the Faraday cage. The cage works by providing a low inductance path to ground. Radio signals striking the cage are basically "sucked" into the ground so they can't get past the screen (another British term).

Ground That Station!

Okay, everyone with a good station ground raise your hand. What, YOU don't have a good ground? There are lots of reasons to get a good *RF* ground in your shack. What is a good ground? Well first, a good ground is NOT the third pin on your electrical outlet. A good RF ground must be a low inductance path at the frequency of interest. Just because a ground connection has DC continuity doesn't mean you have a good ground for your radios. A bad ground can be worse than none, since it will work as an antenna rather than a path for unwanted energy.

So what *is* a good RF ground? You will hear many opinions on grounding practice, but here are the basics. First, you must have a good earth ground to use. This can be accomplished with three eight-foot ground rods about three feet apart. This may seem like a lot of work, and it can be, but it will insure a low inductance connection to the earth. If you can't do this—because of bedrock, cost, or 'cause you're lazy—get as close as possible. A single four-footer is better than nothing at all. Radio Shack carries decent ground rods in both lengths. Once you have a place to connect, you need to make the connection with the shortest possible piece of cable that will provide a low inductance path.

OK, let's step back for a second. That is the third time I mentioned "low inductance." What does this mean? Inductance is a kind of "electro-magnetic inertia." It is the property of an electronic component (in our case a piece of cable) that opposes changes in current. Instead of the current flowing through the component, it is stored in a magnetic field around the component. The inductance of a component is related to the frequency of the energy trying to pass through it. A single wire will have a relatively high inductance at any frequency we are interested in, which is why we use a cable.

The particular type of cable usually used for ground connections is known as "bonding cable." It looks like a heavy-duty version of the shield from a piece of RG-8U coaxial cable. This cable is composed of many smaller conductors woven together. This provides the low inductance connection we want. You can usually find a spool of bonding cable at a reasonable price by searching the tables at hamfests. If you must purchase it from a normal supplier, make sure your wallet is full—this stuff isn't cheap.

Keep It Short!

The longer the distance to the grounding rods, the less effective your ground will be. Ideally, you should locate your shack either in the basement or on the first floor, where the trip to the ground rods is short. This is not always practical, though. Those of you who must run your

Continued on page 43

TURN Your Radio Into a Phone

Simply connect one of our fully automatic phone patches to your base station radio. Suddenly your mobile and HT radios can initiate and receive telephone calls without any assistance.

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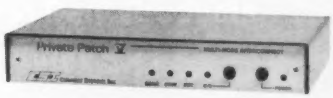

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Using and Stabilizing Varactor Diodes

Have you tried to buy an air variable capacitor for a receiver project recently? They are very rare these days. I've seen them advertised in British electronics catalogs, and in antique radio supplies catalogs in the USA, but otherwise it's catch as catch can. So, what to do? Well, it seems that commercial radio manufacturers today use voltage variable capacitance diodes, commonly called varactors, for the tuning function. These special semiconductor diodes exhibit a capacitance across the PN junction that is a function of the reverse bias potential (see Figure 1).

The diode representations shown in Figures 1a and 1b are in the form of PN junction diode block diagrams. In the N-type region negative charge carriers (electrons) predominate, while in the P-type region positive charge carriers (holes) predominate. When a reverse bias potential is applied, as in Figure 1a, the charge carriers are pulled away from the junction region to form a depletion zone that is depleted of charge carriers (hence acts like an insulator or "dielectric"). The situation is the same as in a charged capacitor: an insulator separating two electrically conductive regions. Thus, a capacitance is formed across the junction that is a function of the width of the depletion zone. And because the size of the depletion zone is a function of applied voltage (compare Figures 1a and 1b), the capacitance of the junction is also a function of applied voltage. A varactor is a diode in which this function is enhanced and stabilized.

Figures 2a and 2b show two common circuit symbols for a varactor diode. In both cases, the normal diode "arrow" symbol is somehow combined with a pair of parallel lines representing a capacitor. In some cases, I've seen a variant on Figure 2a in which an arrow is drawn through the parallel plates by extending one side of the arrow symbol. I suppose that's used to indicate the property of "variableness."

Several different varactors are listed in Table 1. Several of these are also easily available in the ECG and NTE replacement transistor lines sold by parts houses that normally deal with radio-TV repair shops. Look up the specs for NTE-611 to NTE-618, or ECG-611 to ECG-618 to see if they are appropriate for your application. Alternatively, look up the replacements for those diodes in the table from the ECG or NTE crossover directories.

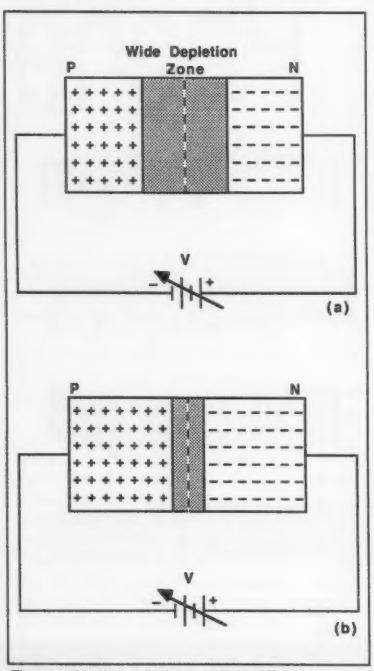


Figure 1. Varactor diode under two different reverse bias conditions.

Varactor Tuning Circuits

The varactor diode wants to see a voltage that is proportional to the desired capacitance. Several different circuits are used to provide this function, some of which are shown in Figures 3 and 4. In all cases, the tuning voltage must be supplied from a reference voltage source that is very stable. It is normally considered good engineering practice to provide +Vref from a separate voltage regulator that serves only the varactor, even when the maximum value of the voltage is the same as the rest of the circuit (e.g. +12 volts). Therefore, always use a voltage regulator to provide the tuning voltage source potential. Most varactors use a maximum voltage around +30 to +40 volts, while many intended for car radio applications are rated only to +12 or +18 volts (check!).

The simplest and probably most popular circuit is shown in Figure 3a. In this circuit, a potentiometer (R1) is connected across the Vref supply, so the tuning voltage (Vt) is a function of the potentiometer wiper position. In many cases, a 0.001 µF to 0.01 µF capacitor is connected from the wiper of the potentiometer to ground in order to snuff any noise pulses so they don't alter the tuning (they are, as far as the diode is concerned, valid tuning voltage signals!). A series current-limiting resistor (R1), usually of a value between 4.7k ohms and 100k ohms, is used to protect the diode in case the voltage gets to the breakover point, and also to isolate its capacitance from the tuning circuit (otherwise, C1 would always predominate). In many cases, a DC blocking capacitor (C2) is needed to prevent the tuning voltage from affecting following circuits, or other circuit voltages from affecting the varactor diode tuning voltage. From the point in Figure 3a marked "To Circuit," the varactor network acts like a variable capacitor.

A variant circuit is shown in Figure 3b. In this circuit the tuning voltage is only a small portion of the reference voltage. Thus, the tuning voltage is produced by a voltage divider made up of three resistors: R1, R2 and R3. In some cases, one or more of the other resistors will be a trimmer potentiometer to set the "fine" or "vernier" frequency of the overall circuit.

Regardless of which tuning circuit is used, the resistors, including the potentiometer, should be low temperature coefficient types in order to reduce thermal drift. Ordinary carbon composition resistors are probably not suitable for most applications.

If you wish to sweep a band of frequencies, i.e. in a sweep generator or swept receiver (e.g. panadaptor or spectrum analyzer), then replace the +Vref potential with a sawtooth waveform. The sawtooth waveform is a linear ramp that rises to a specified maximum voltage, and then drops back to zero abruptly. Unfortunately, it is rarely the case that the sawtooth voltage range, the desired swept fre-

Continued on page 44

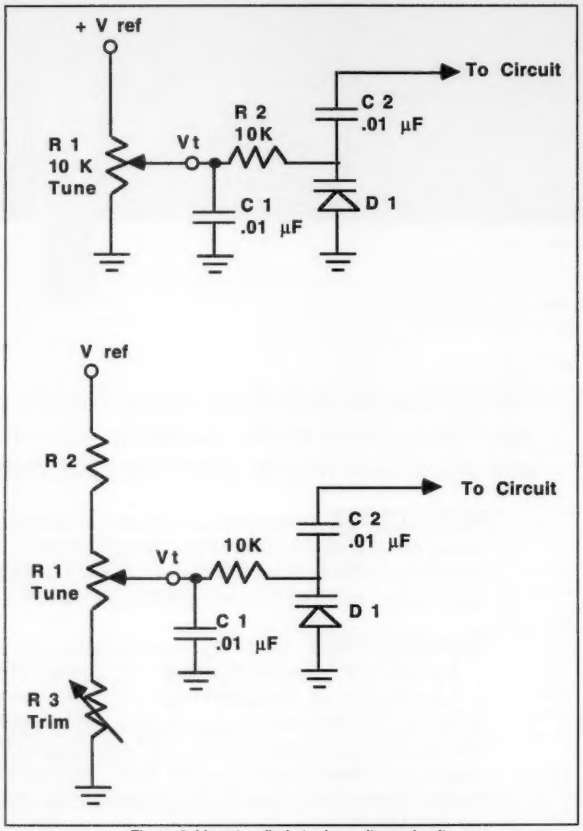


Figure 3. Varactor diode tuning voltage circuits.

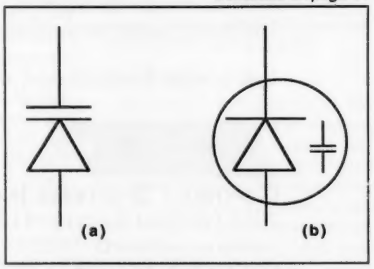


Figure 2. Varactor diode symbols.

PACKET & COMPUTERS

Continued from page 40

ground connection from the second floor might try using copper water pipe, which will have lower inductance than any wire and be cheaper than bonding cable. By the way, copper pipe makes an excellent substitute for ground rods if you have some lying around.

So you've got your good earth connection, and you've got your short run to your shack, now what? The next component that you need is a ground buss. The ideal grounding buss is a flat piece of copper with copper screws for connection to it. The point of the ground buss is to accomplish what is called a "star ground." In this scheme, all ground connections are made to a single grounding point which is itself connected to the earth. DO NOT "daisy chain" the ground connections from one piece of equipment to another. This just provides a path for ground loops and other signal messiness. The star ground is clean because the path of least resistance for RF and offensive signals is to the earth and NOT to other equipment. The reason we use copper is for low resistance. It is traditional and probably best; however, if you must use something else because of cost or availability, it will still work.

Now you've got a place to connect all of your equipment to ground. Your radios will have a ground screw, no problem there, but what about the computers? Most computers expect to be grounded through the three-pin AC connection, but as I said before, this is probably not a good ground for RF. Next month we'll take a look at grounding the computer equipment, and other steps you can take to reduce RFI in your shack. In the meantime, put in the grounding system. Not only will you get advantages when you ground your RFI-generating equipment, you'll also see great improvements in the performance of your radios with the new ground.

How to Contact Me

In addition to the address at the top of the column, you can use one of these electronic addresses to write to me:

jsloman@bix.com

This address is good for anything: questions, answers, business or fun.

N1EWO@NØARY.#NOCAL.CA.USA.NA

This address is for fun only; no business, please.

I look forward to hearing from you about this column or any other topic of interest. Please let me know what you would like to read about, and any other comments that you have. 73 de N1EWO

CARR'S CORNER

Continued from page 42

quency range, and the varactor voltage characteristic are in sync with each other. For those situations we need to be able to provide a sawtooth of variable amplitude to set the sweep width and a DC offset tuning voltage to provide the center frequency function. Figure 4 shows how this might be done.

The circuit shown in Figure 4 uses three operational amplifiers to provide the combination tuning voltage. Op amp A1 provides a variable amplitude sweep width control to change the sawtooth amplitude. If feedback resistor R5 is made 10k ohms, then the output sawtooth will have the same amplitude as the input sawtooth. If higher or lower amplitude is needed, then adjust the gain of A1 by selecting a different R5 value: Gain = -R5/R6 = -R5/10k ohms (the "-" indicates that the circuit is an inverter). For tuning voltages to 18 volts, ordinary 741s can be used for A1 through A3.

Digital frequency control can be accomplished by supplying the reference voltage (+Vref) from a digital-to-analog converter (DAC) that has a voltage output. The binary number applied to the DAC binary inputs will set the tuning voltage, which in turn sets the capacitance of the diode. Those who wish to experiment with low cost components will find that the eight-bit National DAC0800 series devices (available in most local parts stores in the Jameco Jim-Pak display) will provide 256 different steps of voltage (hence also of capacitance and frequency). An op amp is recommended to convert the current output of the DAC080x to a voltage (the national Linear Data Book gives example circuits as well as specs for the different devices in the series).

Temperature Compensation

There is one nasty little problem with the varactor tuning circuit—the thermal drift can be horrible! According to one source, the temperature coefficient of capacitance (ppm/xC) varied from about 30 ppm/xC at +Vref = 30 volts to 587 ppm/xC at +Vref = 1 volt. Ouch! There are three approaches to this problem: ignore it; use Figure 5 or Figure 6.

The circuit shown in Figure 5 uses a fixed, regulated voltage for +Vref, but passes it through an ordinary silicon diode (D2) that is in close thermal proximity to the varactor diode (so they see the same temperature environment). When resistor R1 is set to draw a current through D2 sufficient to get the voltage drop into the 0.6 volt region, then the output voltage +Vref will track the thermal changes to counteract the change of capacitance. In practice, R1 can be the tuning potentiometer when diodes such as 1N4148 or 1N914 are used.

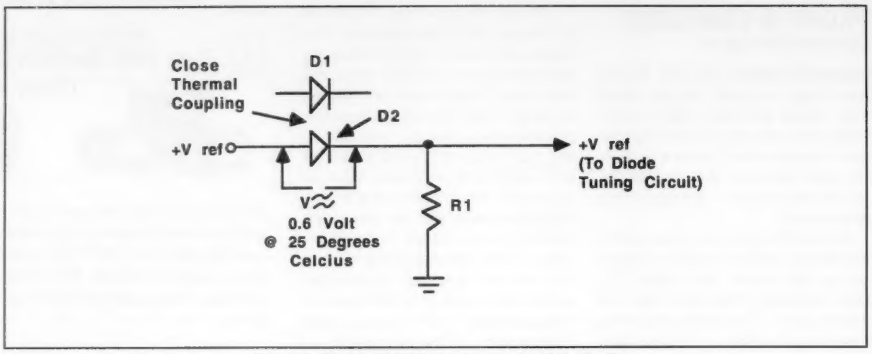


Figure 5. Simple diode thermal compensation circuit.

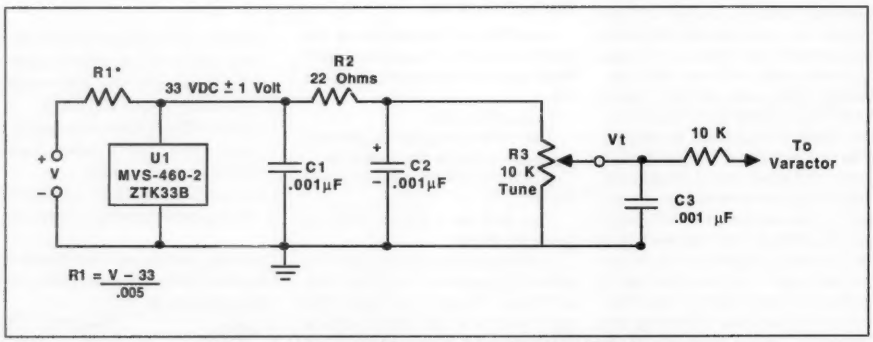


Figure 6. Using a special varactor thermal regulator IC device.

Figure 6 shows a circuit using a special zener diode voltage regulator sold in Europe under both MVS-460-2 and ZTK33B type numbers. It appears to be a +33 volt zener diode that has a -2.3 mV/xC temperature coefficient. It will provide a nominal +33 volt output for all input voltages (V) greater than 34 VDC. Again, the temperature stabilizer (which looks like a diode) is placed in close thermal proximity to the varactor diode being protected. The MVS-460-2 part is in a TO-92-like plastic package, while the ZTK33B is in the normal glass diode package (similar to 1N60 devices).

"Digital frequency control can be accomplished by supplying the reference voltage (+Vref) from a digital-to-analog converter (DAC) that has a voltage output."

Unfortunately, the MVS-460-2 and ZTK33B are hard to find in the USA. I bought some from Maplins Professional Supplies in England (P.O. Box 777, Rayleigh, Essex, SS6 8LU, England) for £0.382 each (as of this writing £1 = $1.57, but the rate changes daily so check before sending money orders denominated in pounds sterling) in lots of 25 or more. Unfortunately, with a minimum practical order of several pounds sterling, plus a shipping charge of £8 for USA and Canada, it is best to order 25 or so. This translates to $27.38 or so, if the price still holds as of publication date. Ordering from the UK is reasonably easy. You can get an international money order denominated in pounds sterling at many banks, but the fee might make you puke (my bank gets $15, which is why I opened a UK checking account). Alternatively, they will accept Visa, MasterCard or American Express cards. The bank card company will make the currency conversion for you, and they use the rate in effect on the day they make the conversion. I've used all three types of cards to make purchases from UK electronic and old book dealers (my other passion), and have experienced no problems. Give them the card number, expiration date and your signature authorizing the charge.

Well, that's that for varactors. If you want to know more theoretical smoke about the subject, then I recommend Motorola Semiconductor's application note AN847 "Tuning Diode Design Techniques" (Motorola Technical Literature Distribution Center, POB 20912, Phoenix, AZ 85036).

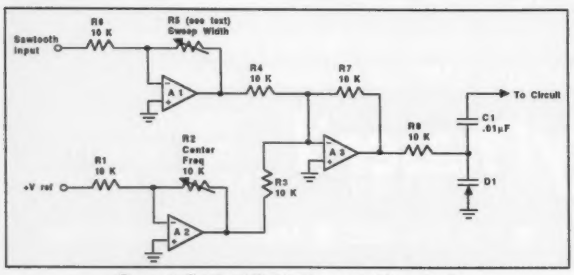


Figure 4. Sawtooth/fixed voltage combiner circuit.

Table 1.

Type No.	Capacitance Range	Tuning Ratio	Frequency Ratio
1N5139	6.8 - 47 pF	2.7 - 3.4	1.6 - 1.8
MV2101	6.8 - 100 pF	1.6 - 3.3	1.6 - 1.8
MMBV105G	120 - 550 pF	10 - 14	3.2 - 3.7
MV209	30 pF	5 - 6.5	2.2 - 2.5

Radio City inc. . . . *Presents*

The Digital Spotlight

Ham Windows

This exciting program lets you control your Kenwood Radio from your P.C. For more details see page 5A.

Save 10%

* when ordered with any Kenwood product

DX DESKTOP

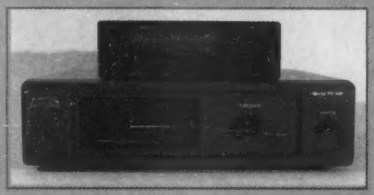
DX Desktop from Debco Electronics is the first truly integreted software and hardware system to totally manage your amateur radio station. Logging, DX cluster interface, awards management, radio and rotor control all without tieing up all your serial ports. A windows implementation that does the work, while you work the DX. See page 3A for details.

Alinco DJ-1200T

Data Radio
See page 4A for more details.

NEW

AEA PK-900 & Yaesu FT-7400H



NEW... **This exciting pair can put you on 9600 Baud (optional board required) with a fully synthesized 440 rig. Both the PK-900 and the Yaesu FT-7400 team up to give you extra excitement for 1993. Save $25 when you order them together. See page 6A for more details.**

Phone Hours

M-F 8 am-8 pm
Sat. 10 am-5 pm
CST

Data Switch

Make your life easier with these accessories including Packet cables and connectors. See page 8A.

Save $25 when you buy the pair

Call For Free Catalog

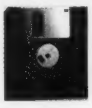
$4 For Air*

Check Us Out

* Warranty Service
* $4 Air Charge*
* Credit Cards Accepted
* Extended Phone Hours
* Orders Placed by 1:00 pm, shipped same day

* up to 15 lbs. in Continental USA

Diskettes - Bulk



Bulk purchased Diskettes in any size and density. Lables available separately.

3 1/2" DSHD	.68
3 1/2" DSDD	.43
5 1/4" 1.2 M	.36
5 1/4" 360K	.25
Lables	.03

68¢ DSHD

50% Off

Packet Radio Primer

This RSGB book brings you the European view on this growing Mode at a 50% discount.

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CIRCLE 153 ON READER SERVICE CARD

Software Spotlight

Educational

Ham Operator

The Ham Operator Software Education Package

This software can take you from your novice license right through to your extra class license. You can take practice exams made up from all sub-elements of a question pool. Or, have the computer identify your weakest areas and test you on those. The Morse Academy will teach you morse code character by character past 20 words per minute. This program also includes a copy of the *FCC Part 97 Rules and Regulations for Amateur Service* and both 3.5" and 5.25" IBM Compatible diskettes.

No Code Ham Radio

A PC ready computer aided instruction package that prepares you for tne Codeless Technician class radio license. The system comes on 3-1/2 and 5-1/4 inch discs. The system presents the questions and reviews your progress as you take practice exams. Exams can be printed or done "on-screen".

No-Code Ham Radio

MFJ Theory Tutor

A computer aided learning program that teaches Radio theory. A menu driven PC program thats !ets you study specific areas or the entire pool. Text/Graphic interface in color. Editions for Novice through Extra.

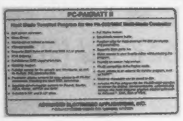
New

WJ2O

MASTER QSO LOGGING PROGRAM

Stop fumbling through paper logs with this full feature logging program. It will allow you to Track DXCC countries and zones, print lables, track QSL's, and print QSL cards from the logged information. The 50 page manual glides you through the 14 accessible data fields and features help utilities and much, much more. Version 3.16 in stock

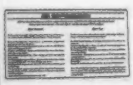
AEA



PC-Pakratt II

THE 232/MBX multi-mode control program for the 232/MBX is a robust full featured program. The program is menu and/or mouse driven. The PACRATT II features include; logging, DOS Gateway, maildrop, multiple TNC files, Macros, scroll back receive buffers and on-screen help. Separate screens for Packet, baudot, ASCII, AMTOR and SIAM modes. Parameter display screens Both 5-1/4 and 3-1/2 discs provided. Supports COM 1-4. Requires DOS 3.0 or higher.

PC-Pakratt II



Com Pakratt with Fax

Two Com 64 programs on plug-in ROM cartridges with the RS232 to TTL hardware provide a split screen program for CW, Baudot, ASCII, AMTOR, and Packet. The QSO's are buffered and the program supports disk operations. The COM FAX program all standard radio facsimile formats. VIC 1525 and MPS 801 printers are supported. Fax transmissions are supported.

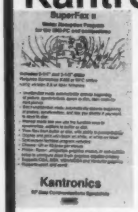
Com Pakratt with FAX

MacRATT with FAX

MacRATT is Host mode software that supports PK-232, PK-88 and 87. MacRATT is written for the MAC and supports multiple windows with scrolling, cut and paste functions. The file transfer status and link are shown in a window display. 20 MACRO keys are provided. The program is compatible with the Macintosh 512e, PLUS, SE and MAC II. A serial cable is included (512e requires an adapter).

MacRATT with FAX

Kantronics



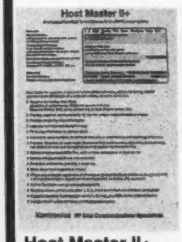
Super FAX II

SuperFax II

Weather Fax program for the PC family. This program requires a 2.8 or later KAM or KPC series TNC. Supports attended and unattended operations. 102/60 LPM modes and Epson printer compatible. Supports CGA,EGA,VGA/MCGA and Hercules graphics on Com1 and 2.

Hostmaster II+

A multi-mode terminal program for the IBM PC and compatibles. The perfect program, for the KAM, KPC and DataEngine. Multiple windows allow simultaneous HF/Packet connects. Provides logging, contest support, file transfers. Works on Laptops.



Host Master II+

Hostmaster versions are available for the Macintosh and the Commodore.

PC-Combo Ver. 2.0

This package contains 3 programs for the IBM PC and compatibles. Superfax receives weather facsimie on CGA color graphics systems. Pacterm-PC is a split-screen terminal program that sends/receives text and binary files. Data-Comm is a logging split-screen terminal program that supports Mono, CGA, EGA, and VGA systems. This program provides 30 function keys and 8 user programmable buffers. Com 1 and 2 only.

Design Programs

Physical Design of Yagi Antennas

Packed with information on how to design or reinforce Yagi antennas so they can survive in the most adverse weather conditions. Covers the structural design of elements, booms and masts, plus the electrical design of Yagi antennas.

Physical Design of Yagi Antennas Software

Contains spreadsheets to calculate element areas from section dimensions, element wind and ice survival, boom survival and torque balance, mast survival, multisection mast survival, and sloping foreground reflection gain.

Morse Tutors

GGTE MORSE TUTOR

A handy tutorial that takes you from beginner to extra code speeds. The choice of Farnsworth or standard modes. All parameters are adjustable and are retained between sessions.

CW Simulator

The program provides codes groups, messages, plain text and QSO simulations. There is even an Air Simulation option with QRM and poor operator keying.

AMECO Complete Morse Code for the PC

From oldest and largest publisher of code training materials. A user friendly menu driven and contains over 18 options. The program turns your PC keyboard into a straight or lambic keyer.

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Control Spotlight

DX DESKTOP

Introducing

Now*

DX Desktop from Debco Electronics is the first truly integreted software and hardware system to totally manage your amateur radio station. Logging, DX cluster interface, awards management, radio and rotor control all without tying up all your serial ports. A windows implementation that does the work, while you work the DX.

- DX data manager: Keeps your DX records and alerts you to new band, zone, mode countries.
- Radio Control: Interfaces to most popular transceivers.
- Rotor Control: Use your mouse or directly from the packet spot to move your antennas.
- Award Tracking: Tracks DXCC countries, bands, modes, zones and WAS. Alerts you to needed stations.
- Logging: A comprehensive logging package with browse and edit capability.
- A windows 3.1 impiementation.

*** shipping 4/23/93**

Keyer

PC Memory Keyer with Morse Tutor

Let this amazing package of IBM compatible software and hardware turn your PC into a memory keyer. You get a total of 100 fuction key macros that you can program to send whatever you want. Comes packaged with the Morse Tutor. *Call for price.*

NEW

Icom IC-737 & Ham Link

Ham Link and the **New IC-737:** This (new) combo brings excitment to your hobby. Never miss a schedual or check in again. Your radio is as close as your telephone with Ham Link. The ARE-61 cable is used to complete the interface to the new IC-737 H.F. transceiver. Dynamic styling and features bring your shack up to date with the Digital world. If CW is your thing, use the ARE-80 CW Link with your Ham Link. This option allows the use of a high speed keyer at the user end

Options

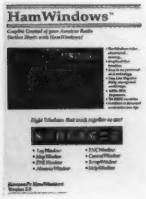
- ARE-80 CW Link
- ARE-61 Icom Cable
- ARE-62 Kenwood Cable
- ARE-63 Yaesu Cable

Call for price!

Save 10% on AEA FAX

AEA FAX

A multi-intensity grey scale facsimile receiving system for IBM and compatible systems. A hardware/software package that allows you to copy grey-scale fax images from the HF bands with your short-wave receiver. The systems supports IBM PC's XT or AT with 640K, Dos 2.1 or higher and 1 serial port. The system also supports HP laserJet or Epson compatible printers. On-screen tuning scope aids in optimum reception.



Kenwood Ham Windows

Ham Windows

Graphic control of your amateur radio station with Ham Windows. The LogWindow monitors the DX cluster, shows your current log and provides current DXCC and WAZ award status. The system also interfaces to HamBase. Spot, work and log new countries with a the latest point-and-shoot technology.

* MapWindow shows 31 regional maps. Navigate around the world with your mouse.
* Large SWL frequency database.

Kenwood TS-850 , IF-232 and HamWindows

Kenwood Control

Kenwood provides a variety of devices to add computer control or allow some units to be worked remotely.

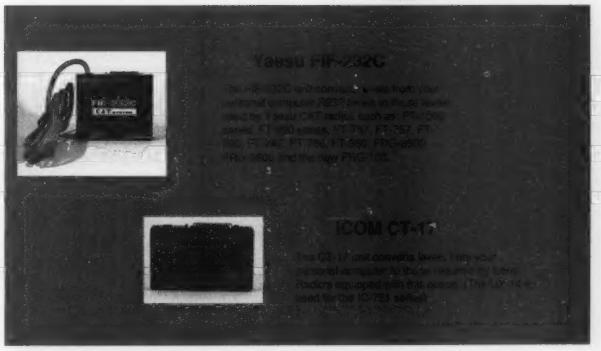
IF-232C converts personal computer RS232 levels, to levels used with Transceivers such as; TS-950 series, TS-850 series, TS-690 series, TS-790A, TS-450 series and the R-5000.

IF-10 A,B & C converts personal computer RS232 levels to levels used by the; TS-140S, TS-680S, TS-711 family and the TS-940 series.

IF-20 allows 4 mobiles to be controlled and operated from a single control point. Accessory for; TM-541A, TM-441A, TM-241A and TM-331A.

RC-20 this remote controller is used in conjunction with the IF-20.

RC-10 allows a single mobile to be operated remotely, accessory for; TM-241A, TM-331A, TM-441A, TM-541A, TM-631A and TM-732A.



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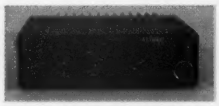
CIRCLE 153 ON READER SERVICE CARD

Packet Spotlight

AEA DSP-2232 & Yaesu FT-736

Match a Yaesu FT-736R with the AEA DSP-2232 TNC to operate in any mode you choose. Add new bands and new modes later. Digital communications at its finest!

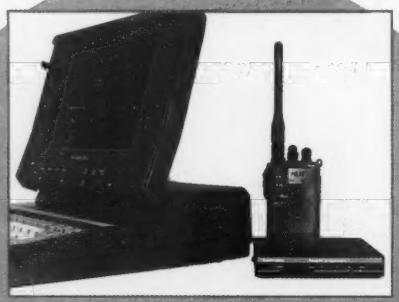
Alinco DR-1200T & AEA PK-88



Alinco DR-1200T and AEA PK-88. This package lets you set up a packet station designed just for the task. The Alinco outputs 25 watts so temperature build-up is held to a minimum. The AEA PK-88 will hold your inbound mail even if power has been turned off.

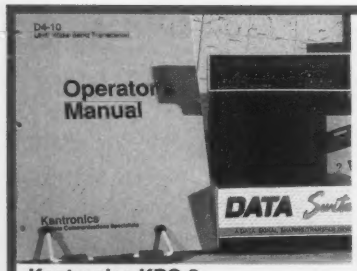
Kantronics KPC-3 & Icom IC-2iA

Save ... Save ... $25 a pair*

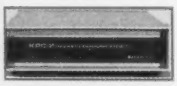


Pocket Packet
Don't miss out on the action at home or away with this light weight pair (it travels easily). Load up the KPC-3 software on your lap top, and run up to two days on the internal 9 volt battery. The Icom IC-2iA supports your voice and data needs in a compact size.

order any radio and TNC and receive a $25 discount on the pair through April

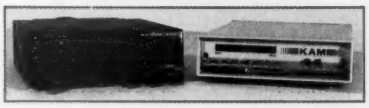


Kantronics D4-10
This voice and data radio offers crystal control precision on the 440 MHz band. 9600 baud and higher Backbone designers will find this radio a popular choice.



Kantronics KPC-2
This is a full size 1200 baud packet controller with a durable design. This unit also supports WEFAX using Superfax- II program for PC compatables.

Kenwood TM-741A & Kantronics KAM



The Kenwood TM-741A and Kantronics KAM form the core of a dual gateway packet station. The open port of the KAM could be used to simultaniously monitor WEFAX, AMTOR, H.F. Packet CW, ASCII, or RTTY. *Join the packet fun now.*

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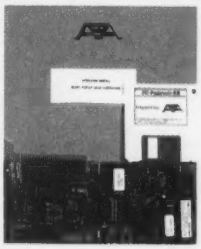
CIRCLE 153 ON READER SERVICE CARD

Packet Spotlight

KENWOOD TS-850 & KANTRONICS KAM

The ever popular Kenwood TS-850 is a great match for the Kantronics KAM all mode. Team this HF up with a TM-241A and keep both T.N.C. ports busy.

AEA PCB-88

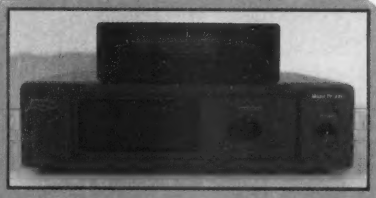


This great little H.T. teams up with A.E.A.'s PCB-88 to keep your work space requirments t a minimum. The DJ-F1T is cabable of 5 watts output to stretch the range of those packet contacts.

Alinco DJ-F1T

Save ... Save ... $25 a pair*

AEA PK-900 & Yaesu FT-7400

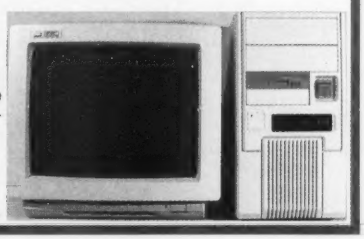


New. . . New . . . New . . . **This AEA and Yaesu combination will get you on U.H.F packet. The FT-7400 offers all the great features found in the FT-2400 for 440 MHZ. This teams up with the all new PK-900 from AEA. The unit provides for an all mode Dual gate way TNC. The options include a low cost 9600 baud plug-in PACTOR firmware, Grey scale FAX and state machine DCD is standard. The PK-900 layout has a custom designed L.C.D. readout and custom die-cast panel for optimum use.**

* order any radio and TNC and receive a $25 discount on the pair through April

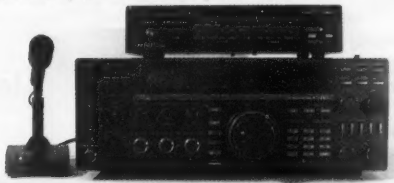
Radio City Computers

Radio City provides a complete line of PC compatible computers built to your specification. Choose your processor, memory, disk configurations, and the number of I/O ports. Build a system to match your shack. Choose one of our configurations for packet, HF Operation, or to run a full contest station. Ask about our built-in packet TNC, and the DEBCO integrated hardware/software system that controls your radio, beam headings, cluster interface and and logging while you work the DX. These are solid metal mini-towers with 250 watt power supplies. You can upgrade your system as your needs change. Check out digital radio, you'll never be the same.



ICOM IC-765 & AEA PK-232MBX

AEA and Icom give you proven performance in this combination. The PK-232 MBX features switchable input ports, provides all modes including NAVTEX and AMTEX. The Icom IC-765 features a large readout and CW filtering standard. The radio offers rear data entry ports to keep the front work space clean.



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CIRCLE 153 ON READER SERVICE CARD

Book Spotlight

DOS 5 Made Easy
This book delivers the ideal one-volume tutorial on the operating system's newest features and functions. It starts with the file system basics, works through I/O and configuration operations, the editor, and concludes with a discussion of hard disk management.

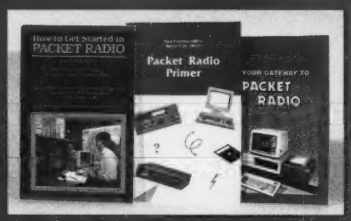
DOS: The Complete Reference
This revised third edition covers all DOS versions for both MS-DOS and PC-DOS users. From an overview of the disk operating system to programming and disk management techniques, each chapter begins with a discussion of specific applications followed by a list of related commands. You'll also find out about DOS's newest features.

DOS Beyond 640K
Here's how to break through that annoying 640K DOS memory barrier. This book shows DOS users how they can maintain larger data files, achieve more flexible multitasking, and run more powerful applications. Covers DR DOS 7.0, OS/2 2.0 and Windows 3.1. Includes 3.5" disk.

Learn DOS - Guaranteed!
Thousands of DOS users swear by this quick-start guide, some say they never would have learned how to use a computer without it. Logically organized, well-paced, and enhanced by lots of helpful review exercises, this book teaches through a series of bite-sized tutorials concepts, commands, and techniques DOS newcomers need to get up and running fast.

PACKET BOOKS

How to Get Started in Packet Radio
This is probably the first packet book written specifically for new Amateurs and computer users who may not be familiar with communications. This book opens with a non-technical description of packet radio explaining how packets get from one point to another including communications via satellites. Then it explains the TNC and how to hook it up. The book concludes with chapters on setting up the packet station , operating networks, BBS's, portable, and high frequency operation.



This introduction to the exciting new world of packet radio will help any beginner to get started with the minimum of fuss. Detailed, practical advice on connecting up equipment, getting on the air, and packet protocol. Much reference information is included as a handy supplement to your equipment manuals. If you're a potential packeteer, this book is for you!

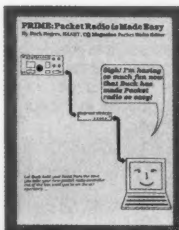
Your Gateway to Packet Radio
This edition updates the first and reveals the new components that are available in the packet world today. This book has the answers, including the latest on networking and space communications using packet radio.

NEW

Basic Packet Radio
By Joe Kasser
LAN-LINK Software
Picture Not Available

System 7.1: The Complete Sourcebook
This book just updated to cover the System 7 "tune-up," QuickTime enhancements, and System 7.1. It also contains more that $100 worth of money-saving coupons for System 7 products and a 3.5" disk with dozens of great Macintosh utilities. This book's unique focus on the special needs of organizational users makes this book stand out.

Dvorak's Inside Track To The Mac
This book is loaded with all the goodies, insights, and tricks a Mac user, beginner or programmer, could ever want. From Mac components to operating systems (focusing on System 7), multimedia, graphics, and desktop publishing, you'll find it here. Includes one 3.5" disk.



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This book gets you on packet fast and easy, holding your hand from the time you take your new packet radio controller out of the box until you're on the air and operating.

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With this book you'll learn how to build a packet station with the latest packet technology. It also discusses building and using a node, building a node matrix interlinking several nodes, and how to build and configure the "Rose" Switch. You'll also learn to build a 9600 baud packet station, packet nodes, backbone and networks.

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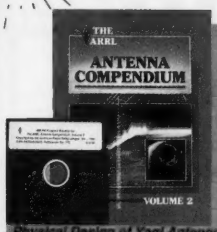
CIRCLE 153 ON READER SERVICE CARD

Book Spotlight



Antenna Compendium Volume 2
An antenna-lover's feast of previously unpublished articles on selecting antennas, computer modeling, baluns and matching networks and many types of popular and esoteric antennas.

Antenna Compendium Volume 2 Software
The diskette contains 11 BASIC programs in ASCII text format, and one compiled Pascal program allowing a more extensive series of calculations than its corresponding BASIC counterpart.

Physical Design of Yagi Antennas
Packed with information on how to design or reinforce Yagi antennas so they can survive in the most adverse weather conditions. Covers the structural design of elements, booms and masts, plus the electrical design of Yagi antennas.

Physical Design of Yagi Antennas Software
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Reflections
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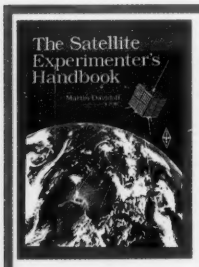

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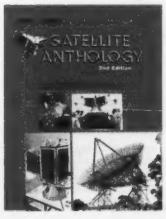

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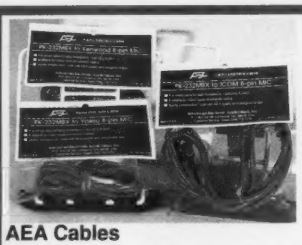

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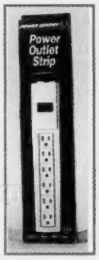

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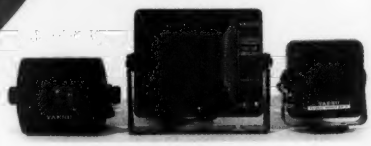

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The Two-Fer

Mr. Webster describes a "classic" as being excellent; established; a standard; a model of its kind. This month we'll take a break from the charge controller to work on a simple spring classic: the Two-Fer. Yes, it was around for a while and it's been through several changes since its conception in the *QRP Quarterly*. The original Two-Fer came from Mike Michaels W3TS and John Collins KN1H. I had my hand in the first prototype PC boards and produced the first Two-Fer kits for Dayton. The kits sold out in a matter of minutes.

Several different versions have appeared in many articles. This is a modification of a modification, so to speak. Bryon Weaver WU2J did the modifying this time around. He changed out the FET used for the VXO and instead installed a common transistor. Notice that the output transistor has also been changed from the 2N3553 to an MRF476. This is a 5 watt RF transistor in the flat pak style. The circuit will produce 2 watts out on 14 MHz with 13 volts VCC.

New Keying Circuit

This time I changed the keying circuit around. Connecting the jumper to either the "A" or "B" connection on the PC board will determine how the oscillator will be keyed.

With the original Two-Fer, the oscillator ran all the time. The oscillator supplied the matching direct conversion receiver with the needed injection for the balanced mixer. The matching receiver for the Two-Fer was a real dog. Most builders of the Two-Fer simply did not build the receiver. Therefore, you had to remove the VCC from the crystal oscillator so you could hear the other station. Otherwise, the crystal's frequency would be heard in your receiver.

With this version of the Two-Fer, you can select how you want to run the crystal oscillator: continuous or keyed. The output of the VXO may be coupled to a direct conversion receiver by a small-value capacitor. Unless you are planning on using the oscillator to drive a direct conversion receiver mixer (as in the original version), then use the keyed oscillator configuration. This way you won't have to do any fancy VCC switching when going from transmit to receive.

A capacitor for coupling RF to a receiver mixer may be mounted on the PC board. If you don't plan on using this feature you may leave the capacitor out. But, by installing it, you have a dandy place to pick up the output from the VXO. I use a frequency counter for that digital readout feeling everyone is so used to.

"Construction is quick and easy with the PC board from FAR circuits. Of course, you could use just about any other method to build the circuit, including perf-board."

If you have a sluggish crystal and keying the oscillator causes chirp, then simply configure the oscillator to run continuously. Of course, you'll need to remove the VCC during receive, but you won't be chirping CW anymore either!

Solid-State QSK

This version also has something new: a solid-state QSK system. By adding a small handful of parts we end up with a no-relay QSK. Best of all, you don't have to include this feature if you don't want to! You can use the T/R controller shown in an earlier "QRP" column to mute the receiver and control the antenna relay if you wish. The choice is up to you.

Construction is quick and easy with the PC board from FAR circuits. Of course, you could use just about any other method to build the circuit, including perf-board. The so called "ugly" construction would work fine, too.

Notice the use of a ferrite bead on the base lead of the transistor. This improves stability in the PA under certain conditions. In some models, I had no problem with the PA stages running away without the bead; using other transistors required installing the bead. In either case, mount the transistor as close to the board as possible.

Most of the parts can be picked up from your local Radio Shack. You should be able to build this transmitter for less than $20, even if you buy all the parts new. If you have a well-stuffed junk box, your total cost may be next to nothing. A junk box CB would be a good source for the final PA transistor and driver. In fact, I've used several different types of transis-

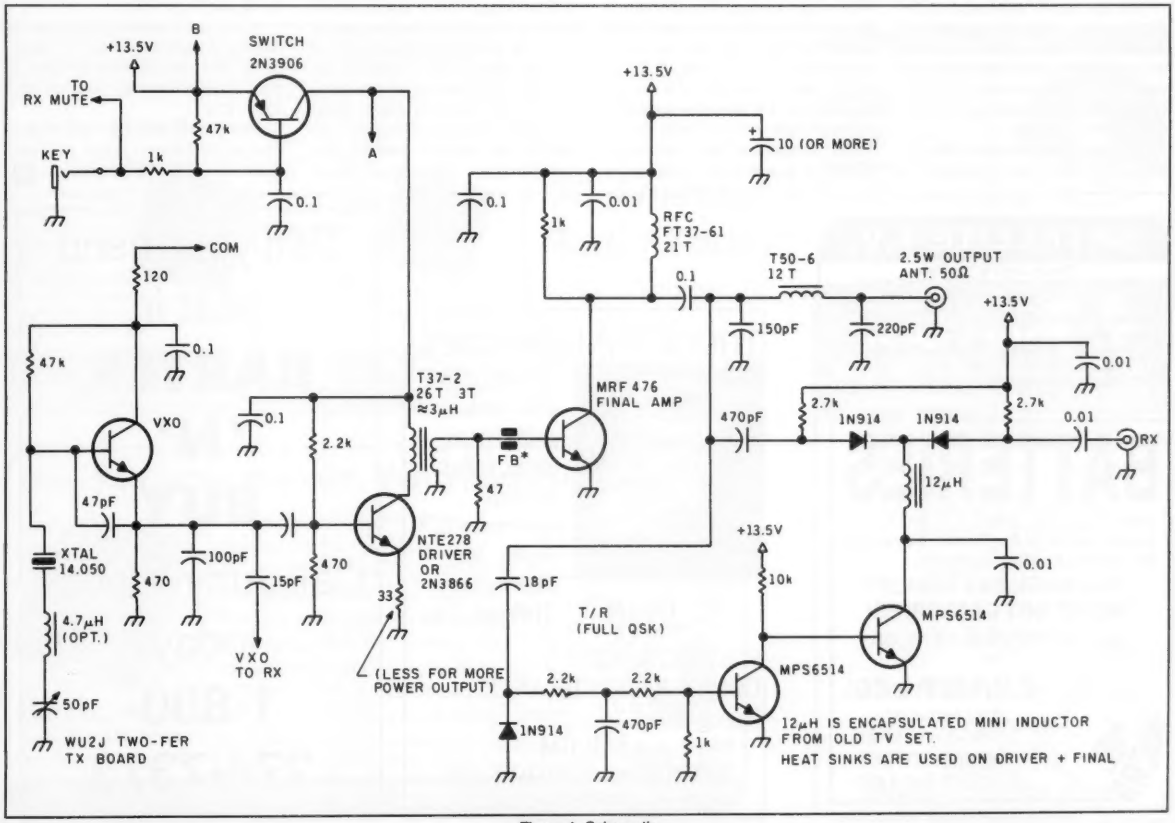

Figure 1. Schematic.

tors in the final stage and all seem to work just fine. Some transistors I tested: 2N3553, 2N3866, MRF479, and the C1909. I used a 2N3866 for the driver with good results, too. A small TO-220 style heat sink keeps the MRF476 from overheating. It runs a tad warm, but not hot to the touch.

Depending on the crystal you use, you may not need the 4.7 uH choke in series with the VXO capacitor. In fact, one of the rocks I have in the junk box would not oscillate with the choke in place. If you can (and if you can find one), use a double-bearing variable capacitor for the VXO. That will last a lot longer than a cheaper version, and will give you a much smoother tuning action, too.

Check out the circuit by first building the switch and the oscillator. Verify operation by listening to the crystal's frequency on a receiver, or use a frequency counter. Don't install the final PA transistor yet. Build the driver stage and test for output in that stage. If you have an RF probe, check for gain in the driver stage to that from the oscillator. An oscilloscope would be an ideal tool to check for gain in this stage.

If everything checks out, then install the PA transistor. Monitor the transmitter's current and, with the output going into a dummy load, key the rig. You should see about 2 watts of RF with 13 volts DC applied. My version demanded 360 mA from the power supply.

With the rig still connected to the dummy load, verify the operation of the VXO by listening to your signal on the receiver. Your frequency counter would be helpful here so you know exactly how much spread your crystal combination produces.

The values for the output filter are for the 20 meter band. I put one of these rigs on my favorite band, 30 meters, by changing the output filter. I did not change the driver transformer at all. The rig works just fine on 30 meters as well as on the 20 meter band. I did not use the QSK feature as I use my T/R controller instead. I see no reason why one could not put this rig on any other band, with the exception of 10 meters, by changing the values of the output filter.

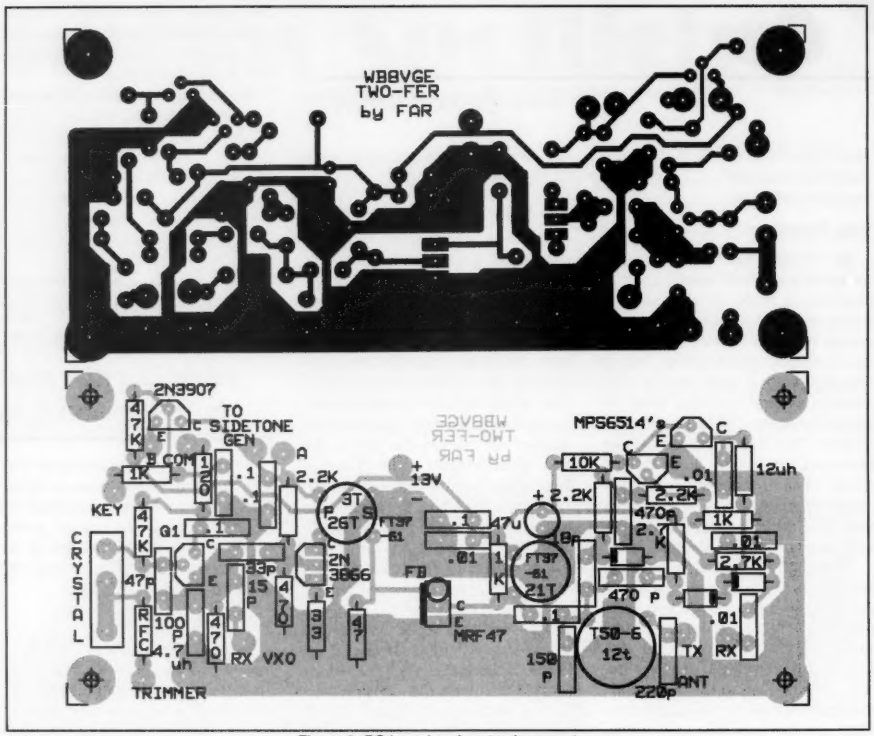

Figure 2. PC board and parts placement.

Even though this is simple project, some of the parts may be hard to come by. KA7QJY Components at P.O. Box 3893, Logan UT 84323 has everything you need to get this rig up and running. Send him a large SASE for his part price lists. Of course, a PC board for the project is available from FAR Circuits, 18N640 Field Court, Dundee IL 60118. PC boards are $4.50 plus $1.50 S & H.

For something as simple as a handful of transistors, the Two-Fer in all its different varieties remains a popular project for beginners and old-timers alike.

Next month we'll get back to our charge controller project and put those power MOSFETs to work.

RTTY LOOP

Amateur Radio Teletype

Marc I. Leavey, M.D., WA3AJR
6 Jenny Lane
Baltimore MD 21208

The more things change, the more they stay the same. If you think that's just a nice saying, you should read on a bit and share some of my mail this month.

Buck WD4ILS, in Chino Valley, Arizona, states that he "particularly enjoyed Terry Arnold's experience working another op who had never heard of a Model 19 Teletype. I started with a Kleinschmidt TT-98, went through Models 28, 32, a 35RO (what a sweetheart!), and various pre-PC `glass TTY' setups, including the M-80, M-800, the really superb ROM-116 for the TRS-80 Model III (from Crown Microproducts) and am just now abandoning my low-technology four-bit Model III for a used (but cosmetically lovely) Compaq-Plus with 10 Mb hard drive, running DOS 2.2.

"Back issues of *73* will yield some interesting solutions to the Baudot-to-ASCII conversion task, including a completely integrated circuit standard and speed converter, all hardware, which some lads in Canada designed to run 110 baud Model 33s on 45.45 baud Baudot. It was an elegant and electronically simple device, and the code conversion firmware was hand-burned onto EPROMS. I built one; it ran like a champ for years and it finally went to the dump when I sold my home. But what a jewel!

"Many of us are so hung up on the sound of the Model 28 that we keep them around as pets. My Model 35RO (an ASCII Model 28) served as a line printer off the ROM-116 setup, just for the sound! The time and effort necessary to cobble up the electrical interface and the `driver' (to compensate for the 72-character line length, as opposed to the 80 character display width of the TRS-80 Model III) were merely a labor of love—like keeping an old Austin Healy alive beyond its useful life."

HF vs. VHF

Another letter represents the newcomer in all of us. It is from Edo van Tijn VK5AFW, of Iron Knob, South Australia. Edo was originally licensed as PAICENI/0ET in the Netherlands in 1948, migrating to Australia in 1951. This recently retired broadcast technician is also interested in these latest phases of the hobby. Edo writes, "I suppose I'll have to go onto HF as, to my knowledge, there is no digipeater nearby, and I don't know if an ordinary FM VHF repeater will do. Nobody, to my knowledge, has ever explained this. As a matter of fact, come to think of it, nobody I know of has ever really explained if HF and VHF packet are interchangeable . . ."

Well, Edo, for all intents and purposes, the signals used on packet really are the same, HF or VHF. What differs are the ways that the digital information is encoded onto the radio signal. To that end, the differences are much the same as the differences between HF and VHF RTTY, that is, FSK vs. AFSK. While we have covered this material before in "RTTY Loop," we will certainly be covering it again. Probably a good reason to subscribe to the magazine, don't you think?

I also appreciated the note from Jyrki Kellomaki, the Radio Officer of the Commodore/Crown Cruise Lines. He relates that after installing an AEA PK-232 interface on one of the ships in the Commodore fleet, he saw the development in digital communications that has occurred during the past 10 years. Last month, this not-yet-radio-amateur purchased the same unit for his personal use, listening to the radio in his home in Finland. Well, Jyrki, the next step is to get your ticket. What are you waiting for?

Build Your Own?

Received via America Online is this question from Matthew Mucker KB5FWG. He identifies himself as a college student on a budget, who has never exercised his full privileges:

"I've been monitoring 144-148 MHz lately here in Houston and want to get in on the action. But my budget and good ol' ham radio spirit have prompted me to try to build my own 2 meter radio. Looking through two or three current magazines, there don't seem to be many books out there telling me how to do this. Do you have any references I could use? I've got a good start with the 1991 *ARRL Handbook*, but would like more references for IF circuits."

My advice about building your own 2 meter radio from scratch, on a college budget? Don't! Many years ago, I built a little 2 meter AM radio, a lunch-box-sized transceiver from the late Heathkit company, called the "Twoer." With its simple regenerative receiver and crystal-controlled transmitter, it was cheap and did the job. But that was when there were three people on 2 meters in the whole Baltimore-Washington area, and miniature meant a seven-pin tube instead of an octal. With the advent of FM, a whole new game was begun.

So, when I was in medical school, I built Heathkit's fancy new transceiver. Still crude by today's standards, it was all I could afford. But, while there are kits available even today, although not from the late lamented Heathkit, I really

Continued on page 77

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While the possibilities of a packet digipeater in orbit tempts the imagination with standard 1200 bps AFSK on FM with the yet-to-be-launched Arsene satellite, other satellite enthusiasts are enjoying great high-speed, 9600 bps packet operation via Kitsat-OSCAR-23.

The satellite was launched on August 10, 1992, representing the product of a cooperative effort between the Korean Advanced Institute of Technology (KAIST) and the University of Surrey in England. Jeff Ward GØ/K8KA acted as Project Manager for the effort. After launch from the French Guiana Space Complex with the TOPEX/POSEIDON scientific satellite and the French S80/T communications experiment, KO-23 spent five months in engineering checkout. Many earth pictures were taken by the excellent dual-camera system and other experiments were exercised. It has even been programmed to "speak" via the 70 cm downlink.

KO-23 was released for general digital communications access on January 15th. Opening messages in several languages were posted to the satellite bulletin board system (BBS) by the Korean control station HLØENJ. Within days, stations around the world were uploading messages, software and picture files. The data transfer capability of this digital amateur radio satellite is greater than any other. Signals are strong and correctly modulated from the transmitter, while the receivers are quite sensitive. The 1300-km-high orbit provides longer access than the UoSAT and microsat series. These factors have made KO-23 the choice for digital satellite fans.

Within a week the request queue was loaded with callsigns on every pass over the United States. Activity is also high in Europe and other densely populated areas. Users quickly discovered the utility of KO-23's digital system and its ease of use and time in the sky, compared to UoSAT-OSCAR-22 with its lower orbit and slightly higher Bit Error Rate (BER) caused by its transmitter.

Earth Station Equipment

To get active via KO-23 several items are needed: a 2 meter FM transmitter for the uplink, a 70 cm FM receiver with preamp for the downlink, antennas, a terminal-node controller (TNC) with a 9600 bps modem and a PC-compatible computer running special software to communicate with digital amateur radio satellites.

While most stations employ circularly-polarized beam antennas for KO-23 work, some have had reasonable results with omnidirectional antennas such as J-Poles or Lindenblads. Better results come with better antennas, but experimentation can yield surprising outcomes. Steve WB5TTS has been quite successful from deep South Texas with omnidirectional antennas mounted on his truck parked outside his apartment. Any pass over 20 to 25 degrees elevation yields good downlink copy and uplink access.

KO-23 has two uplink frequencies, 145.850 and 145.900 MHz. A simple FM transmit system with 25 to 100 watts Effective Radiated Power (ERP) works well to get into the satellite. Since the transmitter must be operated at 9600 bps, the input microphone amplifier must be bypassed. Simple inexpensive FM transceivers can make good high-speed uplink rigs once the internal drive point (usually at the varactor diode) is found.

For reception of the 70 cm downlink on 435.175 MHz, a scanner or 70 cm FM transceiver with a good GaAsFET preamp and a small beam will do very well. To get digital data from the receiver, the signal must be brought out from the discriminator circuit prior to the audio amplifier stage. In many of today's radios the discriminator circuit employs only one IC, an MC3357 (or similar). Pin 9 is the discriminator output and can be connected via a shielded cable to the "audio" input of a high-speed 9600 bps modem.

Photo C. Congratulations to KAIST and HLØENJ uploaded to the KO-23 BBS by JH1AOY in picture (.GIF) form.

The easiest way to get going on 9600 bps is to check the TNC manufacturers for high-speed TNCs or TNCs that easily connect to existing high-speed modems. PacComm in Florida has been marketing satellite modems and high-speed TNCs for a number of years. They can be reached at (813) 874-2980. For those interested in some construction work, the Tucson Amateur Packet Radio Corporation (TAPR) has released an updated version of their TNC-2 compatible 9600 bps modem kit. TAPR's phone number is (602) 749-9479. New options include the Digital Signal Processing (DSP) units from L. L. Grace [(609) 751-9705] and Advanced Electronic Applications, Inc. [(800) 432-8873]. When looking for a 9600 bps solution, ask the TNC or modem manufacturer for information concerning connections to your radios. Some are very simple to interface, while others may not even be worth the effort.

The current group of digital amateur radio satellites all use a communication protocol system that differs from that used in terrestrial AX.25 packet networks. Fuji-OSCAR-20 is the only exception. F-O-20 work requires a Phase Shift Keyed (PSK) modem hooked to a standard TNC, while the others need additional software running in a PC connected to the TNC along with specialized modems.

The satellites employ a broadcast protocol that does not require a connected state to exist between the earth station and the satellite. A user sends a file request to the satellite for a file seen in the directory. The satellite starts the transmission of the file from space. Other stations may also request certain files or pieces of files. The satellite gives each station five seconds of downlink per rotation in the queue. The queue holds a maximum of 20 callsigns. While this may not seem like much, many times a station wants more than one file. While waiting to get all of one, the station may hear and collect pieces of other needed files. When finally requesting the other file, it may already be 90 percent complete, thus requiring very little time to finish. The broadcast protocol has some flaws but works much better than separate connections for each user. It is not uncommon to collect over 500 kb of files in a single pass.

Photo A. KITSAT-A Project Manager Jeff Ward GØ/K8KA and Toshio Tango JR8XPV in the UoSAT control center at the University of Surrey in England. (Photo by JR8XPV.)

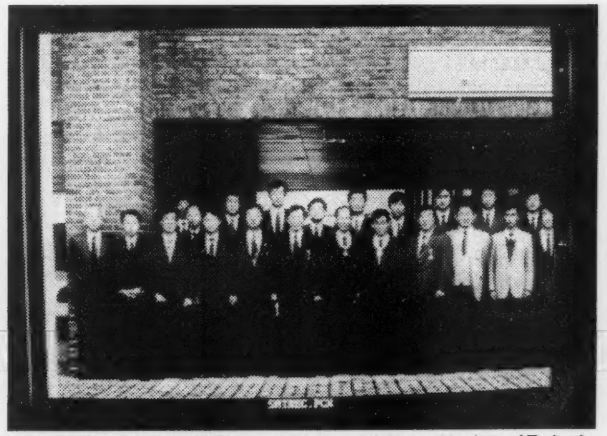

Photo B. Photo of the KITSAT team at the Korean Advanced Institute of Technology uploaded from Korea and downloaded from KO-23 by WB5UUK.

Photo D. Many pictures are uploaded to the KO-23 BBS for worldwide distribution. At 9600 bps transfer can be very fast, even with the shared downlink.

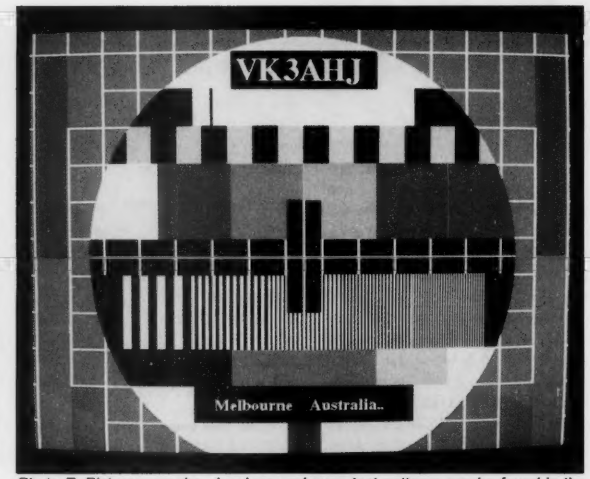

Photo E. Pictures, graphs, drawings and even test patterns can be found in the KO-23 BBS.

The user software is called PB.EXE. The current version was released on April 30, 1992. When running, the program takes control of the communication activity. After setting a few parameters like callsign (KO-23 is HLØ1-11 for PB) and file grab preference (you may not want to collect everything) the program makes file requests and updates the directory of active satellite files when the satellite is in view. In only a few days many megabytes of disk storage can be filled with E-mail, images and new software packages from all over. The PB.EXE software is available free on many terrestrial BBS systems. The AMSAT-DRIG (Dallas Remote Imaging Group) BBS is accessible at (214) 394-7438. The software is also provided with *The PACSAT Beginner's Guide* from AMSAT [(301) 589-6062]. AMSAT does not ship the disk separately, but the manual with disk is an inexpensive $12 in the U.S.

More information on 9600 bps modems can be found in the December 1991 "Hamsats" column. Other details concerning the high-speed digital satellites are in the October 1991, July 1992 and November 1992 columns.

Since UoSAT-OSCAR-14 began open operation for 9600 bps packet, many changes and advances have taken place. Today, much terrestrial packet mail is sent via satellite. This has caused congestion but has provided a service to the amateur community. With many experiments still to be run on KO-23, and the possibility of a new Kitsat in orbit as early as September, concern has been voiced about spreading the satellite gateways to the new hamsat. For now, it's all KAIST experiments and individual packet operation. More 9600 bps satellites are on the way. They work extremely well. In a few years we can expect 56 kbps satellites and compressed digital video, but for now a few megabytes a day via KO-23 will have to do. 73

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HOMING IN

Radio Direction Finding

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Computerized Triangulation, Part 2

Ask a group of radio direction finding (RDF) enthusiasts why they enjoy mobile hidden transmitter hunts (sometimes called foxhunts or T-hunts), and you'll get many different answers. These events are social, educational, challenging, exciting, mysterious, and fun. While some think of a T-hunt as an opportunity to joy ride with radios, I prefer to take my time, be methodical, and savor the experience.

However, there are times when haste is mandatory. During hunts for repeater jammers or stations in distress, all mobiles must work together. One operator becomes the search coordinator, gathering bearings from each station and triangulating them to predict the location of the emitter.

Last month's "Homing In" showed how a computer can speed up cooperative T-hunts. You saw how FastWorkspace, a Macintosh Excel spreadsheet macro program developed by Paul Ternlund WB3JZV, triangulates bearings from as many as 20 hunters at once. It calculates up to 190 fixes and determines a refined position estimate in less than a minute using a double-averaging algorithm.

Where's My Balloon?

As a member of Edge of Space Sciences (EOSS), Paul wanted FastWorkspace to do more than just locate stationary targets. EOSS is a Denver-based non-profit group of hams who promote science and education through amateur radio and high-altitude balloon flights. EOSS launches helium balloons lifting high-tech scientific packages, including 2 meter tracking transmitters.

Successfully recovering 20 pounds of expensive electronics, dozens to hundreds of miles downwind, depends on the EOSS T-hunt team. After touchdown, the beacon's range might be very short due to its location. There is also the possibility that beacon transmitters may fail in flight or at impact. Thus, it's vital for hunters to track the package continuously throughout the flight.

EOSS has launched nine of its own balloons, plus one for another club. With WB3JZV's computer aiding in the search, the recovery rate so far has been one hundred percent.

Of course, the computer doesn't do it alone. A dedicated team of RDFers makes it happen. On the day before launch, Tom Isenberg NØKSR estimates the balloon's touchdown point, using the latest data on wind direction and speed at various altitudes.

All hunters must use the same map and coordinate system for computerized triangulation. The standard map for EOSS is the Pierson Graphics Colorado State Recreational Map. Hunters put transparent overlays with a grid of 5-mile-by-5-mile squares on their maps. Point 0,0 on the grid (the origin) is selected by Tracking and Recovery Group Leader Greg Burnett KØELM, based on the predicted landing point.

"We could use aeronautical maps and do the grid in degrees of latitude and longitude," says WB3JZV. "But aeronauticals don't have good road markings for hunters on the ground. So we just superimpose our standard grid on the Pierson map and our X and Y coordinates tell us where we are and where the T is."

On Your Marks . . .

As last month's QRM-hunt example showed, triangulation errors increase when cooperating T-hunters are grouped to one side of the target. Field Coordinator Bob Ragain WB4ETT (Photo A) would prefer to have them spaced out around the predicted impact point, but the roads and terrain may make this impractical. Furthermore, the balloon sometimes moves horizontally faster than the mobiles can follow.

While guidance in positioning is given on EOSS flights, each team selects its locations based on its own judgement. Each is assigned a tactical callsign (Station Alpha, Station Bravo, and so forth) for ease of identification during the hectic recovery period.

Unless all stations take bearings on a fast-moving balloon at exactly the same time, the balloon's horizontal velocity will cause triangulation errors. So tracking stations stay in radio contact. The primary net is on the Colorado Repeater Association's 2 meter field repeater, placed at a high point near the predicted impact zone. When teams are out of this repeater's range, they can call on 2 meters to Jim White WDØE in Denver, or on 40 meter SSB via Dave Gilpin KBØLP.

Net Control gives a time mark whenever bearing information is needed, normally at 15-minute intervals. Hunters take bearings at these time marks and relay them via the repeater or base stations to WB3JZV. Standard message format consists of the team's callsign, tactical call, location X and Y coordinates in miles relative to the origin point, and bearing in degrees with respect to true north.

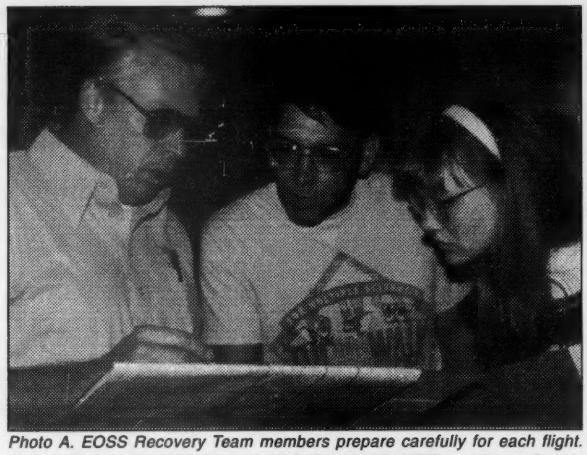

Photo A. EOSS Recovery Team members prepare carefully for each flight. George Riedmuller NØNJM (left), Bob Ragain WB4ETT and Dawn Ragain NØQCW are studying the standard map used by all RDF stations. (Photo by Ann Trudeau KAØZFI.)

WB3JZV's FastWorkspace program creates separate spreadsheets for each sample time. Basic data, including launch time, launch point coordinates, callsigns, and tactical calls, is entered only once. As bearings come in for each sample, Paul types all the hunters' location coordinates and bearings next to their callsigns on the Calculations spreadsheet (Figure 1), then mouse-clicks the Triangulate button. Excel calculates the balloon location and displays it and the surviving fixes on an X-Y chart (Figure 2).

The balloon's location and predicted path is announced on the tracking net so mobile stations can reposition themselves as appropriate.

With another mouse-click, Paul activates the Save-and-Revert macro. It puts the prediction from this sample time into the Results spreadsheet and calculates balloon velocity and heading based on location change since the last sample. Excel then automatically saves the Calculations spreadsheet for this sample to disk and creates a new Calculations spreadsheet with operators' names and calls listed, ready for the next sample.

Callsign	Name	Tact call	X	Y	B	Sta	SPr	Xt	Yt	Err	Dist	SX
WB3JZV	Paul & Ed	Alpha	47.5	37	286	1	1,2	31.9	41.5		12.4	2
WB4ETT	Bob	Delta	36	44	238	2	1,3			Par		4
AD0Y	Marv	Echo	13	45	106	3	1,4	28.8	42.4		9.2	2
N0EUL	Bill	Golf	46	50	246	4	1,5	23.1	44.0		3.6	3
N0TQN	Slate	Hotel	-27	9.7	55.6	5	1,6	25.9	43.2		6.3	3
N0JMH	Greg	India	35	35	312	6	1,7			Div5		2
N0NJM	George	Lima	57	31	306	7	1,8	22.8	44.1		3.3	5
K2NA	Larry	November	-33.0	5.0	55	8	1,9	28.6	42.4		9.0	3
WA0GEH	Marty	Papa	47.0	27.0	310	9	2,3	29.9	40.2		11.3	2
Declination: (11 deg for magnetic; 0 deg for true)					0		2,4			Div5		
Sample Time:					11:29		2,5			Div5		
Initial Location Estimate (X,Y); DistAvg			20.6	46.6	16.3		2,6	29.5	39.9		11.1	
Standard Deviation (X,Y,Dist)			20.0	16.6	20.3		2,7			Div5		
Refined Transmitter Location			27.6	43.3			2,8			Div5		
Calcula start/dura times:							2,9	30.7	40.7		11.7	
19:44:01	00:00:23						3,4	26.2	41.2		7.8	
balloon | fox:							3,5	21.1	42.7		3.9	
balloon							3,6	29.0	40.4		10.4	
							3,7			Far	35.8	
							3,8	20.9	42.7		3.8	
							3,9	32.1	39.5		13.4	
							4,5			Far	21.0	
							4,6	27.5	41.8		8.4	
							4,7	36.6	45.8		16.0	
							4,8			Far	21.0	
							4,9	28.7	42.3		9.2	
							5,6	24.2	44.7		4.0	
							5,7	31.3	49.6		11.2	
							5,8			Far	21.4	
							5,9	25.1	45.4		4.6	
							6,7			Far	74.3	
							6,8	24.0	44.9		3.8	
							6,9			Far	27.0	
							7,8	31.1	49.9		10.9	
							7,9			Far	97.9	
							8,9	24.9	45.5		4.4	

Figure 1. The Calculations worksheet for the last triangulation of the October 31st hunt. The moving-target mode is selected by entering "balloon" under the "balloon/fox" cell. (All printouts courtesy of WB3JZV.)

DAYTON Hamvention® '93

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Nominations are requested for Amateur of the Year, Special Achievement and Technical Excellence awards. Refer to the Hamvention Program for nomination form or contact Hamvention Awards Chairman, Box 964, Dayton, OH 45401-0964.

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Award Nominations: March 1
Advance Registration and Banquet:
USA - April 2 Canada - March 26
Flea Market Space: February 1

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Flea Market Tickets (valid all 3 days) will be sold IN ADVANCE ONLY. No spaces sold at gate. A maximum of 3 spaces per person (non-transferable). Electricity is now available in a portion of the last Flea Market row for $40 additional per space. Rental tables and chairs are not available in the Flea Market. Vendors ***MUST*** order an admission ticket when ordering Flea Market spaces. Please send a separate check for Flea Market space(s) and admission ticket(s). Spaces will be allocated by the Hamvention committee from all orders received by February 1. Please use 1st class mail *only*.

Notification of Flea Market space assignment will be mailed by March 15, 1993. Checks will not be deposited until after the selection process is complete.

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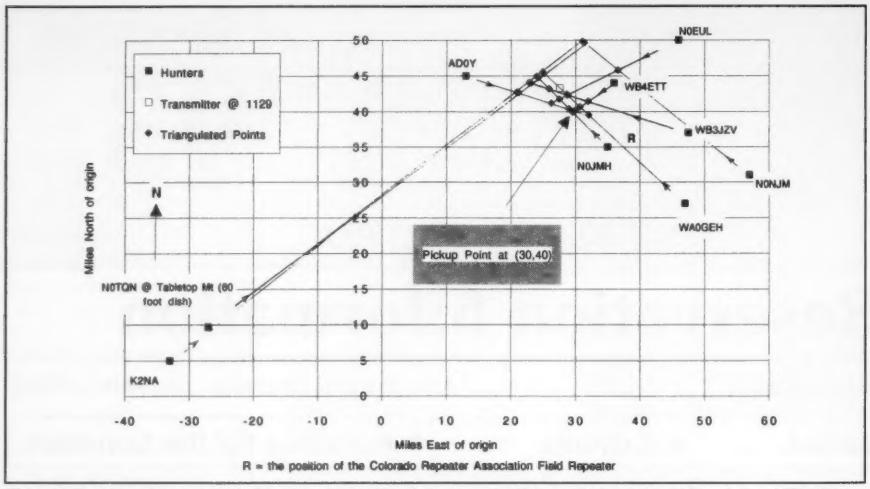

Figure 2. Excel generates a chart of fixes for each triangulation sample. This one is for the last triangulation. WB3JZV has drawn in bearing arrows and identified the actual pickup point.

Time	AvgDist	Xr	Yr	SD_X	SD_Y	SD_Dist	MPH	Heading	Grid Origin	Notes/Altitude
11:32		30.0	40.0						Longmont, CO	Pickup Point
11:29	16.3	27.6	43.3	20.0	16.6	20.3	10	182	Longmont, CO	
11:23	15.6	27.6	44.3	17.8	11.9	14.6	44	56	Longmont, CO	
11:16	8.1	23.3	41.3	9.0	5.0	6.4	56	61	Longmont, CO	17k feet
11:10	6.2	18.5	38.7	7.6	2.7	5.1	41	34	Longmont, CO	
11:00	15.5	14.6	33.0	19.7	6.1	13.7	6	46	Longmont, CO	42k feet
10:45	12.5	13.6	32.0	15.8	6.0	11.5	35	69	Longmont, CO	92k feet (max)
10:30	15.0	5.5	28.9	22.0	6.6	17.4	33	58	Longmont, CO	
10:15	26.3	-1.5	24.4	39.4	17.2	34.0	93	60	Longmont, CO	
10:00	74.8	-21.6	12.9	143.0	39.7	128.2	80	262	Longmont, CO	
9:45	43.2	-1.8	15.5	86.0	26.8	79.0	72	84	Longmont, CO	
9:28	**<Launch>**	**-22.0**	**13.5**	xxx	xxx	xxx	xxx	xxx	Longmont, CO	Longspeak MSch
All distances and standard deviation units are statute miles.										
SD_X is the standard deviation over all x-coordinates.										
SD_Y is the standard deviation over all y-coordinates.										
SD_Dist is the standard deviation over all distances from initial location estimate (aka Figure of Merit).										
9:45 and 10:00 estimates were the worst with SD_Dist of 79 and 128 miles respectively.										

Figure 3. Excel adds a line to the Results chart after each sample and estimates the balloon's speed and heading. Mobile T-hunters use this data as they attempt to follow the balloon's path.

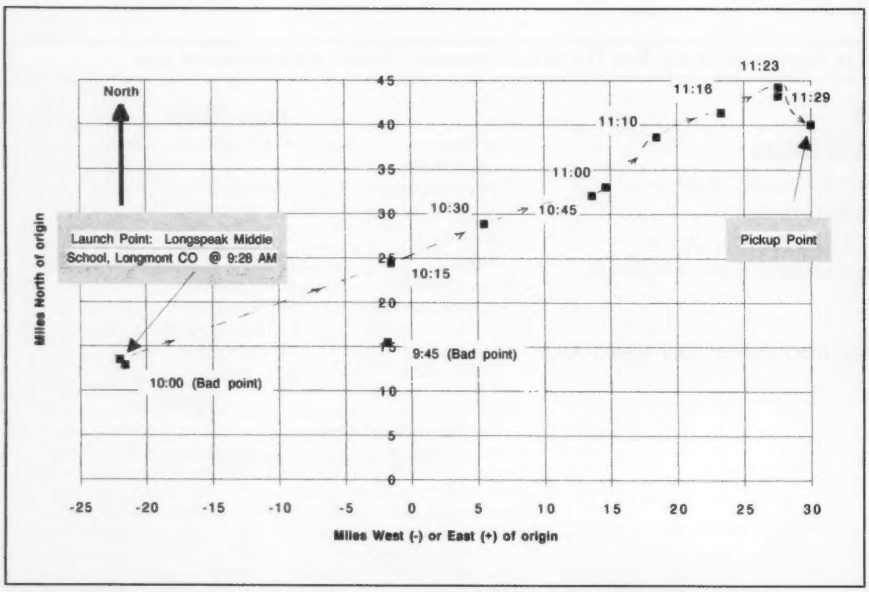

Figure 4. The scatter chart of data in the Results spreadsheet shows the balloon's complete flight path.

A Typical Flight

EOSS flight #9 lifted off from Longmont, Colorado, at 0930 MST last October 31. The payload dangling from the 70-foot balloon included a telemetry and command module with two 2 meter tracking beacons. There was also a video system with a black-and-white camera and a 1-watt ATV transmitter. A commandable gimballed mirror gave the camera views of the ground, the horizon, and the balloon above.

Balloons for scientific flights will eventually break and drop the payload, which parachutes to earth. But the time and altitude at which breakage occurs is very difficult to predict and control. On an EOSS flight in May 1992, the payload unexpectedly stayed in the air for almost 18 hours and ended up in Nebraska, almost 220 miles from the launching point! One goal for this flight was controlled separation of the payload from the balloon, and the package included a device to release the payload on command.

Fourteen T-hunters provided bearings from their mobiles or base stations at one time or another during the flight. The greatest number of bearings triangulated at any one time was 12 at 10:45 a.m., when the balloon reached its maximum altitude of 92,000 feet. The payload drop mechanism worked perfectly, and the package began its descent.

"WB3JZV uses the Station Performance Sheet and practice runs to help searchers take better bearings. 'Before the balloon goes up, I put on a little accuracy check exercise for those stations that care to partake,' he says."

Figures 1 and 2 show the calculations spreadsheet and scatter chart for the last set of bearings, taken just before loss of signal as the package neared touchdown. The triangulated location at that time was only four miles from the eventual pickup point.

The RESULTS.FINAL spreadsheet (Figure 3) and scatter chart (Figure 4) clearly show the balloon's path from Longmont to the grasslands near the town of Briggsdale. Erroneous predictions at 9:45 and 10 a.m. occurred because most hunters were clustered in the predicted touchdown area, 60 miles northeast of the rising balloon.

The Station Performance Sheet (Figure 5) summarizes how each RDF team performed, as judged by the number of times that the program rejected fixes based on that station's

Station Performance Sheet

		Number of Rejected Points at each Sample Time										Total Triangula Pts		Rejection
Callsign	Name	9:45	10:00	10:15	10:30	10:45	11:00	11:10	11:16	11:23	11:29	Rejected	Possible	Rate
AD0Y	Marv		1	1	0	1	0	1	3	4	2	13	82	16%
N0RHE	Tim						2					2	9	22%
WA0GEH	Marty		6	4	4	3	2	1	5	2	2	29	82	35%
N0PCZ	Lonnie	3	2	4	3	6						18	48	38%
N0EUL	Bill	1	1	5	5	5	6	3	4	2	3	35	89	39%
K2NA	Larry	5	7	3	4	5	2	2	5	3	3	39	89	44%
N0TQN	Slate				4	6			5	3	3	21	46	46%
WB3JZV	Paul & Ed	5	4	8	6	6	5	3	3	2	2	44	89	49%
WB4ETT	Bob	6	4	5	4	6	4	3	5	3	4	44	89	49%
K0ELM	Greg	3	5	8	7	3	4		3			33	66	50%
N0LEQ	Roger		2	6		6						19	38	50%
N0JMH	Greg		3	6	6	8	4	7	8	3	2	51	89	57%
N0SBD	Bo		3	10	5							18	30	60%
N0NJM	George					11	5	2	9	4	5	36	52	69%
Number of Possible Points: (by a given station)		7	10	10	10	11	9	7	9	8	8			

Figure 5. The program computes this summary of RDF accuracies after the flight. Stations with bold callsigns were fixed, while the remainder were mobile.

bearings. Rejections occur because bearing pairs are parallel or divergent, or when a fix is too far away from the main cluster of fixes at that sample time.

The lower the rejection rate, the better. It is unlikely that any station will ever achieve zero rejections, especially when hunters congregate on one side of the target, as they do early in the flight.

Sharpshooters' Secrets

WB3JZV uses the Station Performance Sheet and practice runs to help searchers take better bearings. "Before the balloon goes up, I put on a little accuracy check exercise for those stations that care to partake," he says. "I go somewhere within the footprint of the field repeater, fairly close to it. Everybody picks their RDFing spot, then calls in and gives their bearing to me and their grid location. I plug the data into the computer and tell them what their bearing error is."

"I've questioned a couple of guys who get real bull's-eyes, less than a degree of error," Paul continues. "They are consistently red-hot hunters. Before they sight down their antenna booms toward the signal, they take compass bearings on a distant terrain feature from various spots within a 30-foot radius. Then if they're in a local magnetic disturbance, they can tell it and move as necessary. When taking bearings, they take several readings from nearby locations to average out multipath."

I tried out WB3JZV's programs and they worked just fine. I used them to generate the examples in last month's column. If you would like to experiment with computerized triangulation, they are available for your non-commercial use.

For a 3.5" Macintosh disk with macros and spreadsheet files, send $10 to Paul Ternlund, 15459 East Saratoga Place, Aurora CO 80015. Specify standard or high density disk type. As usual, neither *73 Amateur Radio Today* nor I can guarantee this offer. You will also need Microsoft® Excel version 3.0 or higher to run the macros.

Congratulations to Paul and the rest of the EOSS crew for developing educational and enriching uses of amateur radio. For more information on EOSS, contact Vice President Marty Griffin WAØGEH, 1647 East Geddes Circle North, Littleton CO 80122. 73

ASK KABOOM

The Tech Answer Man

Michael J. Geier KB1UM
c/o 73 Magazine
70 Route 202 North
Peterborough NH 03458

Keep On Walkin'

Last month, we were discussing walkies. Let's take up where we left off.

If your walkie is getting power, something should be happening. If the radio is still completely dead, it is very likely that no power is getting to the circuitry. Once you've eliminated bad connections, the power switch, fuses and such, the next place to look is the voltage regulator. Depending on the rig's design, there may be more than one. Especially if you get no computer operation (no display or response to keypresses), check that power is getting to the micro. If not, trace it back until you find it. Although today's walkies use CMOS micros, most of which don't require regulated voltage, many still use regulators, more for the purpose of isolating the micro from possible voltage spikes or reversed polarity than anything else. A dead regulator will, of course, shut down the micro, and it may cause the rig to look totally dead when it really isn't.

If the rig does turn on, but doesn't work properly, you must troubleshoot it like you would any radio. Before you do, though, it pays to give some thought to the specific problems walkies encounter.

QRM

Many hams use their walkies as mobile rigs. Some even use them as base stations. Suddenly, they are complaining that their receivers don't work properly. For some reason, they can't hear the local repeater. Everyone else can, so something must be wrong with the walkie, right?

Not necessarily. The front ends in walkies are rather small, and there usually isn't room for much in the way of bandpass filtering. Also, nearly all new rigs have very wideband receiving capabilities, making filtering impractical. The result is that, when connected to an outdoor antenna, the average walkie is *swamped* with out-of-band signals, overloading and desensitizing the front end. Remember, walkies are designed for use with those little rubber dummy loads they come with, so the front ends are optimized for sensitivity, not resistance to overload.

By the way, an exception to this "rule" is the Radio Shack HTX-202, which does not have extended-coverage receive. Instead, there's lots of bandpass filtering, making that radio pretty immune to signals which will wipe out other sets. Despite the rumors going around on packet radio, there are *no* modifications to enable extended receive on this rig; the hardware just won't support it. Oh well, there's a price to pay for everything, right?

If you encounter a receiver desense problem, the first thing to do is switch to the rubber duck antenna and see if it goes away. I remember having such a problem in Miami once. Using a quarter-wave mobile whip on the roof of the car, I could get into the repeater just fine, but I couldn't hear it very well. I switched to the duck and, even inside the car, I could hear it just fine. The problem is even worse with big base station antennas; there's just too much signal strength. These problems do not indicate any malfunction of the radio, and you shouldn't go in and adjust anything. You just have to accept the limitations of such a small radio.

Speaking of antenna issues, I've seen many instances of worn or broken BNC connectors causing trouble. Especially if you connect various antennas and cables, it can wear out. If your receiver sensitivity suddenly drops way down or becomes intermittent, take a good look at that BNC. If the center receptacle is obviously worn, you may need a new jack. If it looks OK but the problem persists, check the connection to the PC board. In some rigs, wobbling of the connector can crack the connection. Also, sometimes the BNC can simply be loose. If it is, you can bet your ground connection is no good. With most rubber ducks, it doesn't matter because they don't use the ground anyway. But, when you go and hook up a mobile antenna, it doesn't work properly. The fix is simple: a good, solid connection through a tightly secured BNC.

Hello? Hello?

Another common walkie problem is a blown speaker. If you use the rig in the car, you probably have to turn it all the way up, or nearly so, in order to hear it. Some rigs which put out 250 to 500 milliwatts of audio have speakers which are only rated for 100 milliwatts! Under normal conditions, it's no problem. But, when you blast it all the way up for a while, that poor little speaker's voice coil may fry. If the rig works via the earphone but the speaker is silent, disconnect one wire from the speaker and check the voice coil with an ohmmeter. It should either be OK or be open. If it's open, you need a new speaker.

A long time ago, I had an odd experience with this problem. I bought a used walkie which apparently had had a blown speaker. The previous owner had replaced it with a generic one. The

radio worked, but it always seemed off frequency on receive! Oddly, when I pulled it apart, it worked fine. As soon as I put the two halves of the case together, it got distorted again. After scratching my head for a long time, I noticed that the back of the speaker was very close to the discriminator coil. And, the replacement speaker had no shielding behind its magnet. You guessed it—the magnetic field was detuning the discriminator. I got a new speaker from the manufacturer and the problem went away. In today's micro-mini world, you pretty much have to get most parts from the radio's maker. Otherwise, you risk winding up with a kludge that doesn't work quite right.

Lookin' Bad

Today's walkies use LCDs to show your operating frequency and other parameters. I've covered LCD problems in previous columns, but I'll go over the basics again here. Unless the rig has been dropped and the LCD is obviously broken, most likely a display problem is caused by bad contact between the PC board and the display. If the radio works properly but all or part of the display is missing, chances are that water, cigarette smoke or another contaminant has worked its way into your rig. Most LCDs are connected via conductive rubber strips pressed between the display's edge and contacts on the board. It takes good, clean contact and reasonable pressure for it to work. For that reason, the LCD is mounted such that it is pressed pretty hard against the board. Sometimes, the radio's case is used as a housing, with the board being screwed up against the display. Other times, there's a frame for the LCD, and the whole thing comes out of the case as a unit, because the frame is mounted to the board. The frame approach seems to work better, but either scheme can allow junk to get inside and mess up the display. To clean it, you must separate the display from the board, clean the edge of the display, the conductive rubber and the board, and then put the whole thing back together again. I've successfully used isopropyl alcohol. Just be very careful not to drip any on the rig's plastic case or display window, because many plastics are permanently damaged by contact with alcohol. The conductive rubber strips don't seem to have any problem with it, though.

Getting Pushy

Keypads also can get gummed up. If you must disassemble one for cleaning, be extra careful when you pull it apart. Many rigs have individual buttons which are not joined together, and it is very easy to lose them. Always remove the PC board with the radio's face pointing down, in order to keep the buttons in place. Even if you don't lose any, they often get turned around or out of order, so take a look from the front before you screw it all back together again. I can't count the times I've forgotten to do that and then had to take it all back apart immediately after reassembly. Arrrgh.

Go To It

Other than these walkie-specific issues, HTs are no different than any other radios, and normal circuit problems must be troubleshot in the usual way. So, get out that scope and go to it! Now, let's look at a few letters:

Dear Kaboom,

I know this is kind of a weird question, but I'm hoping you can help. One of our lovely California earthquakes has caused a broken circuit to the ceiling heater in our bedroom. I have no idea where the break is. Any idea how to find it?

Signed,
Brrrr

Dear Brrrr,

Yes, this is an odd question, but I believe ham radio can come to the rescue! You're a ham, so why not use some RF? First, be *absolutely sure* that all power is disconnected from that grid of wires. I'd disconnect your main circuit breakers to be sure. (Just for safety, double-check with a voltmeter.) When you know there's no power there, try a little QRP! What I'm suggesting is that you make a battery-powered, very-low-power transmitter. A milliwatt will do. Then, connect it to the wire feeding the heating grid. Now, take a small radio and move it along the ceiling until you find the signal. You should be able to find the break pretty easily; the signal will drop way off. If that doesn't work, you could try a little more RF power (maybe a watt) and a field-strength meter. Either way, I'd use a fairly low frequency, perhaps 80 meters, so that you don't mistake nodes in the wave for the broken wire. Good luck!

Dear Kaboom,

I've started building a 15 meter QRP rig and discovered that I've used carbon film resistors instead of the carbon composition resistors called for. Should I replace them with carbon composition parts? Is this substitution likely to affect the performance of my rig?

Signed,
El Switcheroo

Dear El,

Yes, it will affect performance—the rig may work better! Seriously, though, carbon film resistors are more expensive and made to tighter tolerances than carbon composition units. As far as I know, the film resistors are no more inductive than the comp ones, so it should work fine. Good luck with your rig!

73 and see you all next month.

HAM HELP

We are happy to provide Ham Help listings free on a space available basis. To make our job easier and to ensure that your listing is correct, please type or print your request clearly, double spaced, on a full 8 1/2" x 11" sheet of paper. Use upper- and lower-case letters where appropriate. Also, print numbers carefully—a 1, for example, can be misread as the letters l or i, or even the number 7. You may also upload a listing as E-mail to Sysop to the 73 BBS, (603) 924-9343, (8 data bits, 0 parity, 1 stop bit, 2400 baud), on Special Events Message Area #11. Specifically mention that your message is for the Ham Help column. Please remember to acknowledge responses to your requests. Thank you for your cooperation.

We want to exchange our vintage communication receiver, Radio Holland Type BC348W valve-type, frequency coverage 200 KHz to 18,000 KHz (in 6 bands). Receives AM, CW, and SSB and is in perfect working condition. Would like to trade for any QRP SSB amateur band transceiver with at least 20 meters, but would like all the bands. Must be in working order. We also want to exchange a Drake TRM-24 100 watt Marine band (2, 4, & 8 MHz) SSB transceiver. Has no VFO but has 11 preset crystal channels. Will trade for amateur band QRO or QRP transceiver. Does anyone have information on converting the Drake to the amateur bands, have a schematic diagram, and/or have the address of the Drake Company? Address: *Arshad H. Quadri (AP2AHQ), Larkana Amateur & SW Listeners Club, No. 1989/A 1 Shaikh Street, Karma Bagh Larkana 77150, (Sindh) Pakistan.* Thank you in advance.

Wanted: Manual and schematics for EICO 722 VFO. I will pay copy and shipping charges. *Gary Trudel VE3MPQ, Windsor Ontario, Canada. Tel. (519) 944-2962.*

Wanted: *All About Cubical Quads* by William Orr, which is now out of print. Will pay. Thanks. *Rob Adham KB8KEA, 603 McKee Rd., Beaufort SC 29903. Tel. (803) 521-4554.*

Needed: Schematic for Heathkit Signal Tracer IT-12 and Hallicrafters Receiver S-107, and voltage charts. *Bill Mollenhauer N2FZ, 136 Cedar Ave., Pitman NJ 08071.*

NEVER SAY DIE

Continued from page 4

businesses. But I know that almost everyone listening is going to continue a life of quiet desperation, nailed down to a lousy job somewhere, fighting rush-hour traffic twice a day.

Sure, I wish that hams would read my book ($13 postpaid from Uncle Wayne's Bookshelf), subscribe to my *What To Do* newsletter ($10 for ten issues), and get excited about changing their lousy state and our lousy federal government. A few have read it. And a few of those are talking about action and forming groups.

When I ask for a show of hands at my talks . . . how many of you have worked over 300 countries? Maybe one hand goes up. I ask who's been active on OSCAR. Another hand goes up. How about RTTY? Two hands. How about 75 meter DXing? No hands. How about 2m sideband? Two hands. How about 6 meters? No hands. How about moonbounce? No hands. Packet? A couple dozen hands. SSTV? No hands. ATV? One hand. 10 GHz? No one. Hidden transmitter hunts? Couple hands. MARS? Three hands. Contests? Four or five hands. I'm wondering if Uncle Wayne's Bookshelf should stock enema bags.

None of this cost a lot of money. Most of my life I haven't had much money. I still don't, in my own mind. But a lack of money has never stopped me from doing different things in amateur radio. It costs peanuts to whip together a pair of microwave transceivers and head for the mountains. I remember Howie W2QHH, who had around two-and-a-half zillion certificates collected. He ran maybe 100 watts to a dipole, and he had a ball.

I decided to have some fun one DX contest weekend and fired up my rig on 20m. I wanted to see if I could work 100 countries in one weekend on 20m. Well, I did it . . . just barely. My 100th was just seconds before the end of the contest. Will I ever forget the time I decided I'd work all 50 states on 75m. It took me three nights to do it, and that wasn't even during a contest. Three nights, all night.

My first DXpedition was to Navassa Island, back in 1958, and I'm still talking about it and showing pictures. I'll never forget a minute of that trip . . . boy, that was exciting! We came damned close to getting killed several times.

Well, I'll tell you what. Instead of having anything in mind to talk about at Dayton this year, I'll let you ask questions . . . if you have any. Otherwise I might start talking about things which will be of little interest to you, like some of the things I write about in my editorials . . . like how the mind/body works, or how to cure all illnesses, to lose weight, to fix our rotten educational system, to cut state and federal expenses, to get work, to make really big money, to cut crime by around 80% or more, to cut taxes substantially, to live longer, to get rid of welfare, and other non-ham matters which are probably of no interest whatever to someone who's driven all the way to Dayton for a super hamfest. You want to scrounge the flea market and to see all the new ham gear on display, not get involved with politics or health things.

Heck, if you had any interest in living very long you wouldn't have that huge beer belly hanging out under your tee shirt, be smoking or drinking beer, right? There I go being a scold again . . . being mean. I really do appreciate the hundreds of you who've stopped by the *73* magazine booth to thank me for getting you to lose weight and stop smoking. I also enjoy it when someone tells me that it was my editorials that got them to go into business for themselves, giving them the first real freedom they've had since they were kids.

The *73* Booth

Speaking of the booth, we aren't going to have one this year. Now, I want to tell you that that was a tough decision, but we added up the outrageous cost of the booth space, of shipping the booth stuff out to Dayton (and back), and sending out three people to stand in the booth. Then we added up what we usually take in selling subscriptions and books. Whoa there, we've obviously got to stop boothing at Dayton. It still makes economic sense at all the other hamfests we attend, but the sales at Dayton just don't justify our buying a booth any longer.

A couple of our staffers will still be going, but instead of standing around in the booth for three days, they'll be going around the hamfest visiting the exhibitors to see what's new and to talk about advertising, new product reviews, and so on. If I can find a place to park anywhere near the arena I'll be wandering too, so say hello when you see me. Yes, of course I'll have some discount subscription forms with me. David Cassidy suggested I push around a shopping cart full of my books to sell. Not a bad idea. I could sort of live out of it like a bag lady since I won't have a booth to store the usual ton of stuff I can't stop myself from bringing along . . . HT, cameras, a few samples of my CDs, my laptop computer, and so on.

So I'll try one more year giving a talk and see if there seems like enough interest for me to bother next year. My talk is at 1 p.m. on Saturday, if you aren't too busy haggling over something in the flea market to bother. Maybe it'll rain again and help pack my room. I'll do a little rain dance.

Another *CQ*?

Sure enough, a *third* magazine with that title! There's the ham contest magazine, then *Congressional Quarterly*, and now *CQ (Communications Quarterly)*, published by Digitel. Being in the communications equipment business, I suspect they've never

Continued on page 88

HAMS WITH CLASS

Carole Perry WB2MGP
Media Mentors, Inc.
P.O. Box 131646
Staten Island NY 10313-0006

Photo A. Concrete/sequential strategies include step-by-step directions to complete a task.

Teaching Through Learning Channels

In almost every case, the success or failure of any course, amateur radio included, depends on the effectiveness of the person in front of the room. This is one reason why teachers are encouraged to keep going back for in-service courses and to continuously keep abreast of new educational techniques.

One of the best postgraduate courses I ever took was something called "Teaching Through Learning Channels." The goal of the class was to teach instructors how to observe the signals that students exhibit, indicating how they prefer to learn. These signals are the continuous reference points by which we, as teachers, recognize what it is that students need in order to learn.

I believe that these skills of observation are crucial to the development of good teachers and instructors. Being a skilled observer in the classroom can make the difference between being a good teacher and being a great one. Learning to observe and interpret the kinesthetic/tactual, auditory and visual clues that students of all ages demonstrate in a class will enable the teacher to relate these clues to the students' learning styles.

A really professional teacher knows the value of being flexible in his or her teaching style. Teaching, as well as learning, should be an ongoing process. The instructor who has learned to expand his or her style to include concrete, abstract, sequential and global strategies will inevitably be the one whose students get the best of meaningful learning experiences.

I get many letters from teachers who want to know how to keep the motivation high with young people in a ham radio program. The answer is really the same as it would be for the successful teaching of any discipline: The teacher must continuously increase his or her knowledge, refine his skills, and expand his teaching resources.

Studies have shown that students learn best when a teacher teaches to the preferred learning channel of that person. A learning channel is a way or method by which an individual is able to best process information: visual, auditory, or kinesthetic. The teacher of amateur radio is fortunate enough to have the opportunity to be able to hit all these learning channels in creative and stimulating ways.

Let's define some of these techniques so that any teacher or instructor reading this can begin to incorporate a fresh approach into his own teaching style.

The Concrete/Sequential strategy includes doing such things as having field trips organized step by step, with a goal; structured demonstration lessons; simulations that follow the rules; using step-by-step directions to complete a task; and using concrete materials and following directions. The ham radio instructor can plan field trips to local museums with ham radio stations or electronics exhibits; or plan a visit to the radio room of a major communications center in the area, such as police or fire radio and dispatch rooms; or plan a visit to a local ham who has an impressive station.

The Concrete/Global strategy involves giving choice-optional assignments involving real things, concrete problem-solving simulations, learning through trial and error and using real

objects, committee work on real projects, and discovery learning. There are hundreds of basic electronics experiments applicable to every age group which can be used in an exciting way in the classroom. If you have a large group, break them up into smaller units and provide materials for each group to work with and record their results.

The Abstract/Sequential strategy includes lectures, with questions and answers, in a step-by-step progression; audio and/or video tapes in a step-by-step sequence, almost all textbooks, explaining theories through deductive reasoning, getting the main idea through sequential presentation, and programmed instruction. The good teacher will choose the appropriate textbook, handout materials, etc. for the age and interest level of the group and use this as only one of the teaching strategies to be utilized in the classroom.

The Abstract/Global strategy is having open-ended think sessions, group discussions, allowing think time for reflection before beginning a project or assignment, optional reading assignments, and allowing the students to get their own "Aha." Having a student at the front board during the group discussions is a good idea. The student can make a list of the key words of the discussion. When the class gets divided into triads or small groups after the discussion, they can refer back to the key words and use them to plan their own next steps for their task.

Learning Channel Inventory

About one week into the new term, I administer the following inventory to my classes. The kids have fun filling it out, and I am able to use the results to plan my initial teaching strategies for that particular group.

Check four to six statements that identify how you prefer to learn.

When learning, I prefer to:

a. Work with real things.
b. Talk to myself while reading a book or questions on a test.
c. Read material about what I'm learning.
d. Sketch or doodle while learning.
e. Hear things explained first.
f. Watch a film or video.
g. Work with materials related to what is to be learned.
h. Listen to tapes, the radio or recordings.
i. Watch someone illustrate or demonstrate the information.
j. Perform through simulations, games, role plays.
k. Listen to experts describe and explain the information.
l. Look at charts, maps, graphs or pictures.

Plan your teaching strategies to match the results you get on your inventory. It's probably safe to say that the more you are able to correlate the two, the more effective your teaching will be. Be flexible, monitor your results, and be involved with the learning process of your students. Teaching amateur radio allows you to have a multimedia approach to learning. Take advantage of it!

Be sure to join us at the Dayton '93 Hamvention Youth Forum on April 24th. I'll be showcasing youngsters from all across the country. We've got a dynamic, accomplished group of children who will be speaking this year. Please come and meet them and bring some children along with you. C U there.

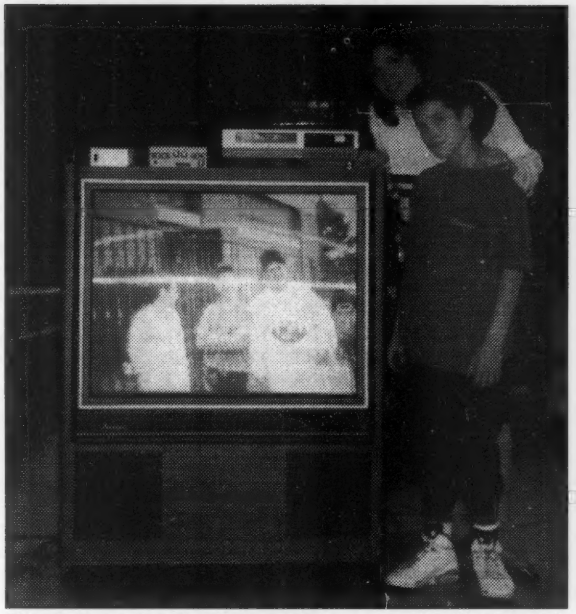

Photo B. Ham radio in the classroom lets you use a multimedia approach to learning. Shown here: An ATV demonstration.

ATV

Ham Television

Bill Brown WB8ELK
c/o 73 Magazine
70 Route 202 North
Peterborough NH 03458

The HatCam

Thanks to the latest in miniature video technology, the ability to carry a complete ATV transmitter and camera on top of your hat is now a reality. Imagine an extremely portable ATV system that weighs in at under eight ounces (with a nine-volt battery) and gives you a range of thousands of feet. With the HatCam system, you only need to turn your head to point the camera. This is the perfect setup for special events, hamfests and ATV demos. No cumbersome clutter of cables are needed to hook up this station—just put on your hat and you're ready to transmit.

The HatCam, shown in Photo A, was designed by Jeff Brown N8UEJ and Dave Pelaez AH2AR/8, and first shown at the 1992 Dayton Hamvention. There are two items that make the HatCam a reality. The four-ounce miniature TV camera from Micro Video Products (the MVP Series V) and the Micro-ATV transmitter described in the July 1991 issue of *73*, page 9. The Micro-ATV transmitter is the size of a postage stamp and puts out enough power (80 mW) for a decent range.

The MVP-V Miniature TV Camera

The truly remarkable achievement is the incredibly small B/W TV camera from Micro Video Products [Telephone: (800) 473-0538]. The MVP-V (see Photo B) measures just 1-1/4" square by 2-1/4" long. It fits neatly in the palm of your hand and is the smallest camera I've seen so far. At $289.95, it's surprisingly affordable for a camera of its size. The MVP-V has a built-in wide angle lens, an automatic electronic iris and an excellent light sensitivity of 2 lux. Its small size and superb performance should make it a popular choice for R/C model ATV, Handie-Lookies, as well as a hamshack camera you can mount just about anywhere.

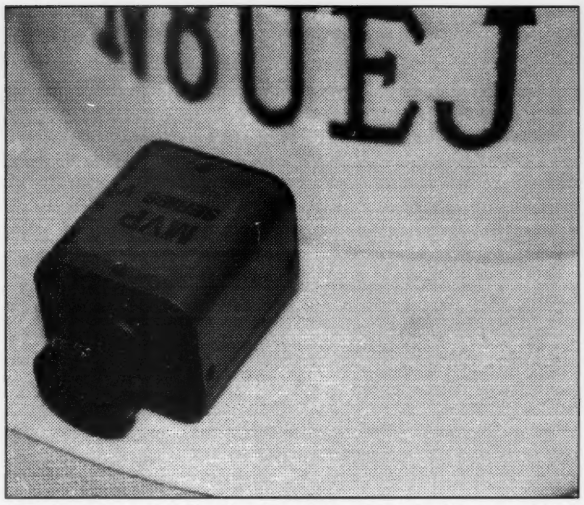

Photo B. Close-up view of the Micro Video Products miniature video camera (MVP Series V).

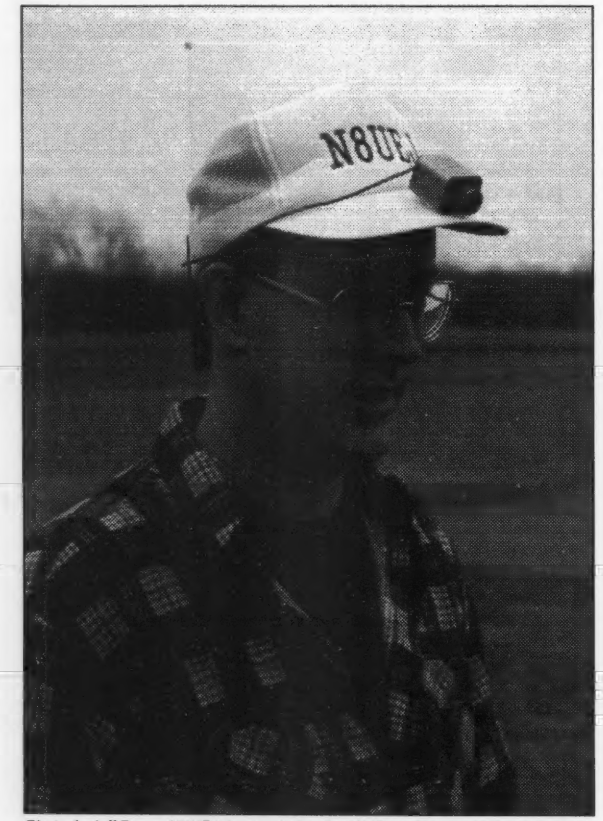

Photo A. Jeff Brown N8UEJ demonstrates the HatCam. The camera is attached to the bill of the hat and the transmitter clips onto the plastic strap on the back.

Build Your Own HatCam

Once you've acquired the transmitter and TV camera, all you need is a baseball cap. The MVP-V TV camera should be mounted securely to the bill of the cap with a 3/8" long 1/4-20 bolt. Try to mount the camera near the edge of the bill so that the hat isn't in the field of view. Next, run the video/power cable around the edge of the cap so that you have enough cable to reach the back of the cap.

Mount the ATV transmitter in a small plastic project box (a case from a kid's walkie-talkie was used for the HatCam shown in Photo A). Make sure you have room in the box for one or two 9-volt batteries, the video and antenna connectors, and the power switch. You can use a small 450 MHz rubber duck for the antenna. If you modify the case from a kid's walkie-talkie, you can use the on-board telescoping whip for the ATV antenna. Now just clip your transmitter to the plastic strap on the back of your baseball cap, hook up the cable, and you're ready for some real portable ATV fun!

You can expect about 30 minutes of life if you operate both the camera and the transmitter from one 9-volt battery. Two batteries in parallel should give you upwards of an hour. If you run with the batteries in parallel, be sure to wire a 1N4001 blocking diode from the positive terminal of each battery to the common positive supply point. As an alternative, you can power the transmitter and camera from separate batteries.

The Future

Of course you can use the miniature components of the HatCam for your own special applications. You no longer need a 1/4-scale R/C plane to carry a large ATV transmitter and camera. Many of the smaller planes should have enough lift to fly this system. R/C cars and even boats are other likely candidates. How about a Dog-Cam? Now you can see your pet's point of view as it catches a Frisbee!

I imagine that as cameras and transmitters get even smaller, you might even see a practical version of the Dick Tracy video wristwatch in the not-too-distant future. 73

HATCAM SUPPLIERS LIST

MVP Series V TV Camera
Micro Video Products
1334 So. Shawnee Dr.
Santa Ana CA 92704
800) 473-0538; Fax: (714) 545-8041

Micro-ATV transmitter
Assembled/Tested:
P.C. Electronics
2522-WG Paxson Ln.
Arcadia CA 91007
(818) 447-4565

Kit Version:
Elktronics
12536 T.R. 77
Findlay OH 45840
(419) 422-8206

SPECIAL EVENTS

Ham Doings Around the World

Listings are free of charge as space permits. Please send us your Special Event two months in advance of the issue you want it to appear in. For example, if you want it to appear in the January issue, we should receive it by October 31. Provide a clear, concise summary of the essential details about your Special Event. Check Events.TXT in ***Special Events File Area #11*** *on our* ***BBS (603-924-9343)****. for listings that were too late to get into publication.*

APR 3

AJAX, ONTARIO, CANADA The South Pickering ARC, Inc., and the North Shore ARC, Inc., will sponsor a Flea Market from 9 AM-2 PM at the Pickering High School on Church St. North, Pickering Village, in Ajax. Vendors: To register in advance, contact *South Pickering ARC, Inc., P.O. Box 53, Pickering Ontario, L1V 2R2, Canada.* Make checks payable to the South Pickering ARC, Inc. For info, contact: *Ron Brown VE3WZ, (416) 839-3711; Kim Becker VE3SVZ, (416) 571-6883; Garry Brisbane VE3REP, (416) 683-4335; or Bob Partridge VE3SRD, (416) 839-75850.*

CHESAPEAKE, VA The 8th annual Chesapeake "SpringFest 93" Amateur Radio/Computer Show will be held at Virginia Beach Pavilion from 8 AM-3 PM. VE Exams by CDXA: Bring original/Copy and ID. Talk-in on 146.970-. Dealers contact: *Preston P. Ipock N4SHI, (804) 543-4610.* Flea-Market contact: *Robert M. Holt N4SFH, (804) 487-1896,* or *Chuck Moseley KD4IJU, (804) 545-1303.* Sponsored by Chesapeake ARS.

NW ROCHESTER, MN The Rochester ARC will hold their annual Hamfest at John Adams Jr. High School, 1525 31st., NW Rochester, starting at 8 AM. Talk-in on 146.82 (W0MXW/R). Write to *Scott Sherratt N6VB, 6982 Indigo Ct., NW Rochester MN 55901.*

WILLIAMSBURG, VA The Williamsburg Area ARC will sponsor ARRL Exams April 3rd. Contact *Andrew Swanson WJ4X, (804) 253-2811.*

APR 3-4

SPOKANE, WA The 16th Annual Inland Empire Hamfest/Computer Show will take place at Spokane Youth Sports Bingo Hall, East 2230 Sprague Ave. Set-up Fri., Apr. 2nd, 12-5 PM. Contact *"Ike" Brown KF7PU, (509) 459-2667.*

APR 4

RALEIGH, NC The Raleigh ARS will present its 21st Hamfest/Computer Fair in the Jim Graham Bldg., NCS Fairgrounds, from 8 AM-4 PM. To pre-register for VE Exams, contact *Vince AA4MY, (919) 847-8512.* Dealers, contact *Rollin Ransom NF4P, 1421 Parks Village Rd., Zebulon NC 27597. Tel. (919) 269-4406.* Talk-in on 04/64.

SOUTHINGTON, CT The 10th annual Fleamarket of the Southington ARA will be held at Southington High School from 9AM-1 PM. Set-up at 7 AM. For details contact *Steve N1GCV, (203) 621-6191.* Talk-in on 146.88, 224.80, 444.25, 145.49. Pre-register for VE Exams by sending an SASE to *Southington ARA, P.O. Box 873, Southington CT 06489.*

APR 10

CLINTON, TN Oak Ridge ARC will hold the "Oak Ridge Hamfest '93" at the National Guard Armory in Clinton, from 8 AM-5 PM. ARRL sanctioned. Talk-in on 146.88, 146.97 (W4SKH). VE Exams by WCARS; contact *Ray Adams N4BAQ, 4325 Felty Dr., Knoxville TN 37918.* Hamfest contact: *Gene Muncy KB4UMM, (615) 435-1588.*

FERGUS FALLS, MN The 6th annual ARRL Affiliated Hamfest sponsored by the Lake Region AC, will be held from 8 AM-3 PM at the Hockey Arena, Otter Tail County Fairgrounds. VE Exams. Set-up at 4 PM on Friday. Contact *Keith McKay N0FKF, (218) 826-6274.*

JOHNSON CITY, TN WCARS/VEC Exams will be held at 10 AM in Room 223, Technology Bldg., ETSU. Contact *Charles Hensley AC4QF, (615) 743-5144 or (615) 926-1171 x7807;* or *C.V. Jayne, Jr. W4NHT, (615) 282-5822.*

MARION, NC VEC Exams by the West Carolina ARS, will be held at 2 PM at the Asheville Federal Bank Bldg., Main St. Please call *Cecil D. Potter WB4UCF, (704) 724-4007,* for details.

MARYVILLE, TN The West Carolina ARS will offer VE Exams at 7 PM at St. Andrews Church Hall, W. Broadway. Please contact *Carroll Peabody W4PCA, (615) 982-5839.*

MEMPHIS, TN VE Exams will be held at 9 AM at Central Church, 6655 Winchester Rd. Sponsored by WCARS. Please call *Win Guin W2GLJ, (901) 754-4552,* or *Nita Wofford N4DON, (901) 363-4971.*

ROANE COUNTY, TN VE Exams sponsored by WCARS, will be held at 10 AM at Pond Grove School, Rockwood. Contact *Richard Spillee AA4KS, (615) 354-4281,* or *Bill Smelcer KA4AAD, (615) 882-9070.*

SOUTHINGTON, CT The Southington ARA will hold its 10th annual Fleamarket at Southington High School from 9 AM-1 PM, at the Southington High School. Set-up at 7 AM. Talk-in on 146.88, 224.80, 444.25, 145.49. Contact *Steve N1GCV, (203) 621-6191.* VE Exams by pre-registration only; send a SASE to *Southington ARA, P.O. Box 873, Southington CT 06489.*

WEST MEMPHIS, AK WCARS VE Exams will be held at 9 AM at Rosewood United Methodist Church, 2303 E. Barton Ave. Contact *Gene Bagley AB5BL, (501) 739-4029,* or *Rev. Richard Gregory AB5CH, (501) 735-4060.*

APR 11

JASPER, TN West Carolina ARS VEC Exams will be conducted in the Jasper Public Library at 1 PM. Please call *Charles Wooten KD4XX, (615) 942-5116,* or *Wallace S. Brown KD4XV, (615) 942-2836.*

APR 15

FENTRESS COUNTY, TN VE Exams by

the West Carolina ARS will be held at 7 PM at the First Baptist Church. Call *Mike Ledbetter AB4BX, (615) 879-8626,* or *Fred Davis K8DOC, (615) 879-9268* for details.

APR 17

BOWLING GREEN, KY The National Guard Armory on Hwy. 231, near the Green River Pkwy., will be the location for a Hamfest/Computer Fest sponsored by the Kentucky Colonels ARC, from 7 AM-2 PM. Talk-in on 146.25/.85 rptr. Call *Denver, (502) 777-3681,* or write: *P.O. Box 9781, Bowling Green KY 42102.*

COLUMBIA, SC The West Carolina ARS will offer VEC Exams at the Red Cross Bldg., Bull St., starting at 8:30 AM. For details, call *Ray Rogers N4WR, (803) 345-3373.*

GOOCHLAND, VA The S.M.A.R.T. Swapfest will be held at the Goochland County Fairgrounds beginning at 8 AM. Set-up at 6 AM. VE Exams at 12 noon. Talk-in on 147.27 and 444.800. Contact *Wanda Clemons KD4OCK, (804) 556-4392.*

JOPLIN, MO Joplin ARC Hamfest '93 will be held from 8 AM-3 PM at the John Q. Hammons Trade Center, NE corner of Hwy. 71 and I-44. VE Exams. Talk-in on 147.210+. Call *(417) 623-3610, days,* or *(417) 782-5848 eves;* or write to *J.A.R.C., P.O. Box 2983, Joplin MO 64803.*

KNOXVILLE, TN VE Exams for upgrades only will be held at Pellissippi State Tech. Comm. College, Room B-129 (formerly STIK, Pellissippi Campus). Sponsored by West Carolina ARS. Contact *Ray Adams N4BAQ, (615) 688-7771,* or *Rich Slover ND4F, (615) 539-4821.*

MEMPHIS, TN The WCARS will sponsor VE Exams at Central Church, 6655 Winchester Rd., at 9 AM. Please call *Win Guin W2GLJ, (901) 754-4552,* or *Nita Wofford N4DON, (901) 363-4971* for details.

NEW ALBANY, IN WCARS/VE Exams will be held in Room 204 at Knob View Bldg., Indiana University South, Grant Line Rd., from 10 AM to 2 PM. Please contact *Dick Truax K8GVU, (812) 246-6377,* or *"Mac" McCrory NM9A, (812) 944-6661.*

SYLACAUGA, AL The Talladega RAC 2nd Annual Old Fashioned Hamfest will be held at B.B. Comer Memorial School from 8 AM-4 PM. VE Exams. Friday night Set-up 5 PM-8 PM. For details, call *Jim Green KD4BHH, (205) 245-7825.* Talk-in on 145.270.

APR 18

CAMBRIDGE, MA The MIT Electronics Research Soc., the MIT Radio Soc., and the Harvard Wireless Club, will hold a Flea Market from 9 AM-2 PM at Albany and Main Sts. Set-up at 7 AM. Talk-in on 146.52 and 449.725/444.725 - pl 2A (W1XM rptr.). For info call *(617) 253-3776.*

OMAHA, NE The Ak-Sar-Ben ARC, Inc., will hold their annual Auction at the Millard Social Hall, I-80 and Hwy. 50 at exit 440 (about 1/4 mile south of the interchange on Hwy. 50). Buyer and seller registration begins at 7:30 AM. The Auction starts at 9:30 AM. Talk-in on 146.34/.94 (W0EQU rptr.). Contact *Ken Noel AJ0A, (402) 592-2338 after 6 PM - PBBS: 145.01 AJ0A @ K0BOY.NE;* or *Todd LeMense N0PHF, (402) 397-7465 after 6 PM PBBS: 145.01 N0PHF @ K0BOY.NE.*

ROCKFORD, IL A Hamfest/Computer Show, sponsored by the Rockford ARA, will be held at Rockford Metro Centre from 8 AM-4 PM. VE Exams. Talk-in on 146.01/.61. For info, call *Joe N9HEZ, (815) 399-6995.*

SULLIVAN, IL The Moultrie Amateur Radio Klub (M.A.R.K.) will hold their 32nd annual Hamfest at the Moultrie County 4-H Fairgrounds on the Caldwell Rd., 5 miles east of Sullivan. VE Exams from 9 AM-12 Noon, by pre-registration only; contact *M.A.R.K., P.O. Box 91, Lovington IL 61937.* For Hamfest details, call *Dave Duggins N9MPM, (217) 234-3283.*

WAREHAM/BUZZARDS BAY, MA The Wareham ARC will hold a Hamfest from 10 AM-2 PM. Talk-in on 147.915/.315 rptr., 146.52 simplex. For a flyer, send SASE to *Barry Kennedy N1EZH, 24 Bungalow Ln., Buzzards Bay MA 02532.*

WEBSTER, MA A Hamfest will be held by the Northeastern Conn. ARA, at the Point Breeze Restaurant, starting at 9 AM. Talk-in on 147.825/.225, 146.52 simplex. Contact *Chuck Weimer WB1AOC, 3 Plainview Dr., Danielson CT 06239. Tel. (203) 774-1723.*

APR 23

KETTERING, OH The Southwest Ohio Chapter of the Quarter Century Wireless Assn. will hold its 1993 Annual Banquet the first evening of the Dayton Hamvention, at Neil's Heritage House, starting at 7:30. Reservations required. Gordon West WB6NOA will be the featured speaker. Contact *Robert L. Dingle, Treas, Chapter 9, 1117 Big Hill Rd., Kettering OH 45429-1201.*

APR 24

ASHEVILLE, NC WCARS/VEC Exams will be offered at the Health and Social Services Bldg., at 9 AM. Please call *Norman G. Harrill N4NH, (704) 253-1192,* for details.

DALTON, GA WCARS VE Exams will be held at 3 PM at the Unity Baptist Church, Burleson Rd. Please contact *Bert L. Coker N4BZJ, (706) 259-5625,* or *Harold W. Jones N4OTC, (706) 673-2291.*

MAY 1

CEDARBURG, WI The Ozaukee RC will sponsor its 15th Annual Cedarburg Swapfest, 8 AM-1 PM, at the Circle-B Recreation Center, Hwy. 60 and County I (20 miles north of Milwaukee, west of Grafton). Set-up at 6:30 AM. VE Exams at 9 AM. Talk-in on 146.37/.97 and 146.52. Contact *ORC Swapfest Chairman, 11448 Laguna Dr., Mequon WI 53092. Tel. (414) 242-4995.*

FREDERICKSBURG, VA VE Exams will be held in the Rappahannock Library on May 1st. For details call *AC4SK, (703) 373-7076,* or *AC4MB, (703) 891-5581.*

GRAND JUNCTION, CO The Western Colorado ARC will hold its annual Hamfest in Liff Auditorium at Mesa State College, from 9 AM-2 PM. Seminars and VE Exams will be available. Talk-in on 146.94. Call *(303) 242-6035* for info.

OWEGO, NY The Southern Tier Hamfest will be held by Southern Tier ARC at Marvin Park Fairgrounds, Rte. 17C and Exit 64, from 8 AM-4 PM. They will also sponsor their 34th annual Banquet. VE Exams. Talk-in on 146.16/.76 or 146.52/.52. Contact *STARC, P.O. Box 7082, Endicott NY 13761-7082.*

SOUTHEASTERN, VA The Hampton Roads Radio Assn. will sponsor W5YI Exams on May 1st. For details, contact *Bill Runyon N4BDH, (804) 487-8611.*

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MAY 1-2

ABILENE, TX The Key City ARC will sponsor the ARRL West Texas Section Convention and Hamfest at the Abilene Civic Center from 8 AM-5 PM Sat., and from 9 AM-3 PM Sun. VE Exams. Pre-registration must be received by April 27th. Talk-in on 146.160/.760. Contact *Peg Richard KA4UPA, 1442 Lakeside Dr., Abilene TX 79602. Tel. (915) 672-8889.*

SIERRA VISTA, AZ The Cochise ARA will hold its Annual Hamfest at the club training facility on Moson Rd. VE Exams. Contact *Robert Hollister N7INK, (602) 378-3155 after 6 PM,* or write to *CARA, P.O. Box 1855, Sierra Vista AZ 85636-1855.*

MAY 2

BEMIDJI, MN The Paul Bunyan ARC will hold its annual Hamfest from 8 AM-3:30 PM, at the Moose Club. Talk-in on 146.13/.73. Flea Market. VE Exams. Contact *Roben Beyer, Hamfest Chairman, P.O. Box 524, Bemidji MN 56601. Tel. (218) 751-4801.*

YONKERS, NY A Giant Electronic Fleamarket will be held at Lincoln High School, Kneeland Ave., from 9 AM-3 PM, by the METRO 70cm NETWORK. Indoor Flea Market. VE Exams. To register, call *Otto Supliski WB2SLQ, (914) 969-1053.* Talk-in on 440.425 MHZ PL 156.7; 223.760 MHz PL 67.0; 146.310 MHz; 443.350 MHZ PL 156.7.

SPECIAL EVENT STATIONS
APR 2-4

BAY CITY, TX The Matagorda Co. ARC will operate N5QWF (or any other Matagorda Co. ARS) 0000Z-2400Z Apr. 2-4, in conjunction with the Bay City Heritage Day Festival. All bands in all modes. For QSL, send SASE to *N5QWF, 4404 Doris St., Bay City TX 77414.*

APR 3-4

GREEN VALLEY, AZ The Green Valley ARC will operate KC7MF 1600Z Apr. 3-2300Z Apr. 4, to commemorate the closing of all Titan Missile sites in the USA. Phone - 14.250, 21.330, 28.360 MHz. CW - in the Novice portion of the 10m band, around 28.150 MHz. For a certificate, send QSL and SASE to *GVARC, 601 N. La Canada, Green Valley AZ 85614.*

APR 12

HALIFAX, NC The Roanoke Valley ARS will operate KO4KP, 1400Z-2400Z, during the Halifax Resolves celebration commemorating our nation's first written request for independance. Operation will be in the General subbands and 10m Novice. For QSL, send QSL and SASE to *Terry Cieszki, Rt. 2 Box 519B Zoo Rd., Roanoke Rapids NC 27870.*

APR 17

CONSTITUTION ISLAND, NY The West Point Cadet ARC, in conjunction with the Orange County ARC, will operate W2KGY from the historical landmark "Constitution Island," from 1400Z-2000Z. Operation will be on 10 thru 80 in the first 10 kc of the General phone portion. QSL with SASE to *SE Station W2KGY, Cadet AR Seminar, M Morgida, Dept. of EE and CS, USMA, West Point NY 10996.*

SEATTLE, WA The NorthWest QRP Club will sponsor the First North West QRP Club Contest from 1700 UTC-2100 UTC on 7035-7040 kHz and 14060 kHz. For details, please contact *Bob Farnworth WU7F, Contest Editor NWQRP Club, Bellevue WA 98006.*

APR 17-18

1993 CONNECTICUT QSO PARTY Operation will be 2000Z Apr. 17-2000Z Apr. 18, with a rest period 0400Z-1200Z. Phone and CW. Sponsored by the Candlewood ARA. For details, write to *CARA, P.O. Box 3441, Danbury CT 06813-3441.*

APR 23-24

THOMASVILLE, GA The Thomasville ARC will operate W4UCJ 1600Z-2400Z Apr. 23rd, and 1300Z-2200Z Apr. 24th, to commemorate the 72nd Annual Rose Festival. Operation will be in the lower General portion of the 80, 40, 20, and 15m phone or CW subbands, and the Novice 10m phone band. For a certificate, please send QSL and SASE to *Thomasville ARC, P.O. Box 251, Thomasville GA 31799.*

APR 24

SNOWFLAKE, AZ The Pleasant Valley ARC will operate KB7PIY from 1500Z-2300Z, to commemorate Astronomy Week. Operation will be on the 10m Novice phone band. For astrophoto certificate, send QSL and 9 x 12 SASE (2 postage units) to *A.R.S. KB7PIY, Bill Wood, 14246 N. Westminster Pl., Fountain Hills AZ 85268-2706.*

APR 24-25

LAFAYETTE, LA The Acadiana ARA will operate W5DDL from 1300Z-0200Z Apr. 24-25, to celebrate Festival International Delouisiane. Operation will be in the lower portion of the General 40, 20, and 15m phone bands, and the lower portion of the Novice 10m phone subband. Send QSL and SASE to *Acadiana AR Assn. Inc., E. Miller, 612 Harding, Lafayette LA 70503;* or *c/o P.O. Box 51174, Lafayette LA 70505-1174.*

APR 25

OGDENSBURG, NY The Ogdensburg ARC will operate N2MXR 1400Z-2100Z, to commemorate the 125th Anniversary of the City of Ogdensburg. Operation will include 7.280, 14.325, 21.325, and the Novice portion of 10m +/- QRM. For an official certificate, send QSL with contact # and either a #10 or a 9 x 12 SASE to *Pete Baltradis, RD 1 BOX 206, Norwood NY 13668.*

MAY 1-2

PHILADELPHIA, PA Station WA3BAT will be operated from 1300Z May 1st-2000Z May 2nd, by the Olympia ARC, to commemorate the 95th anniversary of Admiral Dewey's triumph over the Spanish fleet at the Battle of Manilla Bay. SSB/Phone - 3.895, 7.245, 14.245, 21.265, 28.365, and 145.270. For a certificate, send QSL and a 9 x 12 SASE to *Olympia ARC, P.O Box 928, Philadelphia PA 19128.*

MAY 3-JUN 3

HASTINGS, NEW ZEALAND Due to its past popularity, the 160m "Have A Go" Activity has been re-activated. This will be run during the NZART Field Day Contest, but will not be a part of it. This activity will be held from 2000 hrs NZT May 3rd-0300 hrs NZT June 3rd, LSB or CW, primarily at 1840 kHz (but anywhere in the band). Contact *David Walker ZL3DK, 36 Ardrossan Ave., Flaxmere, Hastings, New Zealand.*

RTTY LOOP

Continued from page 55

don't advise it. It is hard to match the convenience and stability of a commercial rig for these frequencies, and who says you have to buy new? Ask around at a local club, check hamfests, network through friends and local radio stores. If you keep your eyes open, I suspect you will be able to pick up a secondhand, slightly older, 2 meter radio for well within your budget. Who knows, someone reading this might just offer to help.

Getting on Packet

Matthew's second question revolves around packet. He says that, "while perusing the ads in the magazines, I read an article or two about packet radio. I've heard that packets are relayed all across the country. How does this work? I assume I broadcast the message and a local repeater will pass it along. How do I get started in this? It sounds a whole lot cheaper than calling long-distance!"

Well, before we get to the first part of the question, let's deal with the end. Don't forget that no matter what, ham radio is non-commercial communication that cannot be used to replace commercial carriers. So, unless your father is a ham, better stay with the phone company, or at least one of them.

Now, packet communication involves bundling little packets of digital communications together, each packet of which is addressed to where it should go. You send these packets to either the addressee or another station which can relay it along. That relay station, an automated update of the old message relay system which founded a radio relay league, is a digipeater. Don't confuse this with a conventional VHF repeater. Whereas the repeater merely retransmits the received audio on another frequency, the digipeater regenerates the received data, thus cleaning up the data. More on this in future columns.

Digital communications span the spectrum from old-fashioned radioteletype to the latest computer wizardry, and "RTTY Loop" loops around the same neighborhood. For example, volumes one and two of the PC compatible RTTY programs remain available, as is a collection of PC archiving utilities. Each collection is over a megabyte in size, and will fit on a high density 5" or 3.5" disk, or on a bunch of low capacity ones. To receive your copies, send me sufficient media, a postage-paid return disk mailer, two dollars in US funds per disk, and be sure to tell me which collection you want. Send it all to me at the above address, and I'll turn it around real soon. Don't forget to send me your comments and questions as well; to the address above, or via CompuServe (ppn 75036,2501), Delphi (username MarcWA3AJR), or America Online (screen name MarcWA3AJR). 73

ABOVE & BEYOND

UHF And Above Operation

C. L. Houghton WB6IGP
San Diego Microwave Group
6345 Badger Lake Ave.
San Diego CA 92119

Collecting Surplus Surface Mount Components

This month we'll cover one method to help you stock your junk box with some exotic components. Normally, the removal of the miniature components presents a large problem when undertaken in mass, but I think you will be quite pleasantly surprised to find out how well this method works.

First, a little about the components that can be reclaimed. Surface mount components, being very small, make new construction respectably smaller than conventional circuits.

A quick example is a standard IC. Take any basic device and you will find that it is available not only in the standard 14- or 16-pin plastic package that we are all familiar with, but most come in surface mount packages as well. The main difference is size. The standard 14-pin IC is just over an inch long, with pin-to-pin spacing of 0.1". The surface mount equivalent is less than half the length and about one quarter the height. See Figure 1 for the size comparison.

ICs are not the only components that come in these miniature packages. Resistors, capacitors, inductors, transistors and a lot more are coming packaged this way. In fact, I just found in surplus several mixers for RF that work over their range of 5 MHz to 2000 MHz. A lot of exotic surface mount components are being used in electronic equipment manufacture due to size constraints. This should make more of the older surface mount systems available in the surplus or scrap market for amateur use. Be observant and you might locate a gold mine in surplus components in your local area.

One problem that has hung on with these packages getting smaller and smaller is repairing or modifying circuits. Most people have difficulty removing a chip capacitor as it is very small and must be desoldered on both ends to remove it from a PC board. Why are surplus surface mount components so attractive when you can't easily unsolder them with a soldering iron? Because you don't use a soldering iron. What you want to do is advance into the 21st century in your soldering techniques. I don't propose that you go out and purchase a $1,000 soldering station. No, what want you to do is to spend about $20 and be able to have some of the best methods of soldering (or, in our case, unsoldering) at your fingertips. What device can you purchase for $20? A heat gun. This device is normally used for removing paint by the blistering method, then the blistered paint is scraped off. In our application you will use this same heat gun for electronic component unsoldering, or shrink tubing applications.

D-text:The heat gun has limitations, but as long as you know that soft plastic IC sockets and similar devices will be affected by the gun's intense heat (melted) it will be no problem. Sockets and such can be removed with care, as can some soft plastic components, but I don't see much advantage to keeping them. I find that I want the ICs and electrolytes as well as the tantalums in preference to plastic mounting hardware. I don't bother with resistors, although they come loose free for the ride. These heat guns are capable of blowing a hot 700 to 800 degree blast of air in a stream quite similar to a hair dryer. This will heat up the solder in about two minutes of air flowing about the solder junctions in the air stream.

Before using a heat gun to strip a PC board of components you can use a soldering iron and an X-Acto™ knife or some other means to gently lift each lead of delicate components. When you start to unsolder a PC board, direct the heat gun's nozzle to an area on the backside of a PC board to remove conventional chip components first. In some cases you might just have to tap the board to jostle loose surface mount components, letting them drop to a paper below for collection.

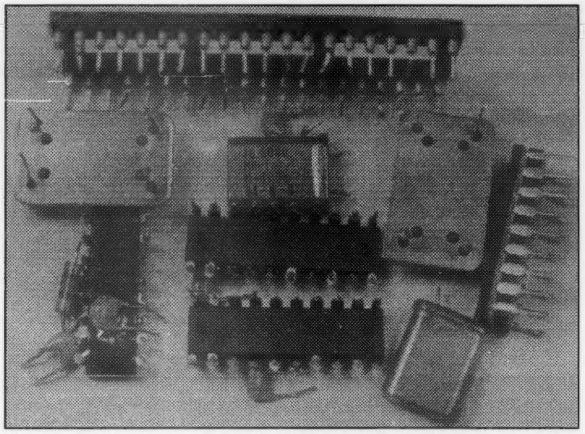

Photo A. Components removed with a heat gun. Note the clean pins, even on a 40-pin socket removed from a 386-25 PC board. The 20-pin chips under the 16 MHz crystal show dirty solder leads. These chips were pulled too soon—not all of the solder was allowed to flow before the chip was pulled.

In using a heat gun, apply the exhaust (much like a hair dryer, only much hotter) to the PC board area to be heated and position the gun about half an inch from the surface of the board. Don't get too close as this will only burn the PC board. A half inch to an inch is about right. You will have to do a little experimenting with this technique and I suggest a scrap of PC board to try for a first attempt. I have found that positioning the PC board securely in a bench or drill vice will allow you to work rapidly on it. Position the board vertically for conventional rear-soldered PC boards and horizontally for surface mount boards. This leaves both hands free—one for the heat gun and the other for tapping or gently removing components with an X-Acto knife.

Bring the solder to molten temperature around the components to be removed. It will be very apparent as some of them will squirm about their solder pads. This takes about two minutes for the initial heat application. After that, the nearby components take a much shorter time to detach from the board. Some of the ICs can be removed with forceps by gentle lifting (that is, assuming that the component leads were not bent when they were originally inserted on the PC board).

This process sounds unbelievable but in actual practice it works quite well. Last night I unsoldered a PC board to recover some connectors and ICs from a defective 386-25 MHz computer motherboard. I completed removing all the components from the board in about 10 minutes. The board was empty of all chips that were soldered, leaving just the sockets and a few of the other components. Bypass capacitors, clock oscillators, 40-pin sockets, etc., were all removed in this operation with the heat gun.

The procedure to use with surface mount components is much the same, but instead of directing the heat to the rear of the board, direct it to the component side where the surface mount part is attached. This works well to remove top-mount components on the PC board. When a heat gun is used components retain their exact form and are not distorted in the removal process. If a conventional soldering iron (pencil type) is used to remove a four-leaded transistor, the leads each have to be heated and lifted with a knife. When this operation is completed, the part is removed but all four leads have been bent or otherwise deformed in the process and sometimes are quite resistant to being removed intact. With the heat gun, the only possible damage that can be subjected to the part is excessive heat. Most devices take the operation with the heat gun well. Just use reason and common sense. In no case should the PC board burn or blister or smoke—if it does you're too close and there's too much heat. Back off and give it a little time. Don't try to rush here.

Don't rush the solder during its heating. The part can be pulled off prematurely, but if you wait a short time it will come off quite clean without effort. For instance, when removing a 14-pin or even a 40-pin chip, heat the board from the solder side for about two minutes to bring the section of board to temperature and watch the solder on the opposite side of the board. It will soon show signs of being molten. Don't pull the IC or socket just yet, even if it seems to come with a little pressure. If you wait another 15 seconds or so it will pull off without pressure and the board will wick off the excess solder from the part, making the pins on the IC clean. You will not have to clean up the part later if you take time in this step.

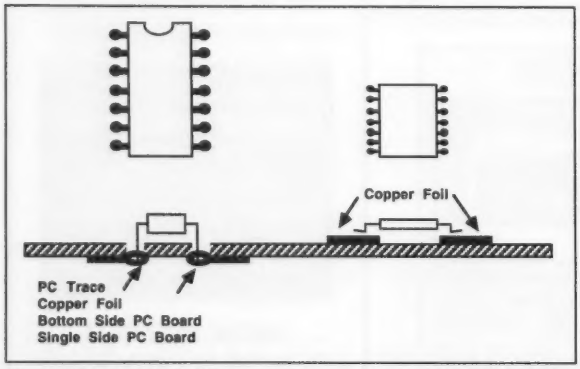

Figure 1. Standard 14-pin DIP, compared to a surface mount IC. The 14-pin DIP mounts through holes drilled in the PC board. Surface mount means just that—it is soldered on the component side of the PC board (no holes).

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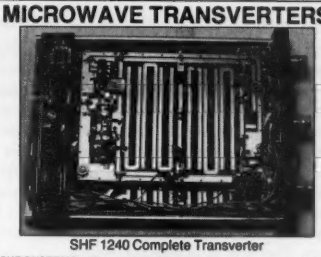

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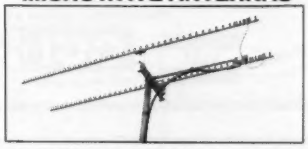

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I suggest you invest in a similar unit that can be picked up in a well-stocked hardware store. On the West Coast they can be obtained in the "Home Depot" and "Home Club" type home handyman stores. You should not have trouble finding a similar heat gun as this type of store sells just about everything, including the kitchen sink. I checked with Sears and they have two models of heat gun to chose from. The first is a Wagner Model 15115, which heats to 850 degrees, priced at $24.99. The second is a variable heat control type, also from Wagner, with heat to 1100 degrees, priced at $29.99.

I have not tried either of these two models from Sears, but they are quite similar to the unit I picked up from a local hardware store. My heat gun is dual-heat, stating low heat of 700 degrees and high heat of about 1500 degrees. It's called a "Super Stripper Mod. 1500" and is made in Taiwan. I don't think the upper temperature is actually reached; I have no way to measure its temperature output. Needless to say, a good AC power connection is required as these heat guns draw quite a few amps to do their job efficiently. Extension cords should not be used as they may limit output. Some more common extension cords are constructed from small diameter conductors and can't support the higher currents needed by the heat gun.

Mailbox Comments

Oscar Franco LU7ATH, from Argentina, recently corresponded with me and is working on setting up some YIG oscillators for the microwave bands below 5 GHz. I sent him a PC board for the 5.6 GHz band to assist his operation. I also sent a few SRA-11 mixers that are good to 2000 MHz RF. I hope these assist him in construction projects in Argentina.

The biggest problem in shipping components to others is the distance and assurance that the components do arrive. Air shipment and insurance can be quite costly. For us here, it's all too easy to hop in the car and go to our local parts supplier. We should all take another look and be quite thankful that we have the opportunity and good fortune to have electronic supermarkets, or even a Radio Shack, from which to pick up simple parts. They are so easy that we forget what it's like in other parts of the world.

Another traveler I have communicated with is Thad N2QMG. Thad's current project a 10 GHz wideband FM transceiver and CW IDer. I have to redesign the PC board for the IDer to make it more compact and use fewer jumpers, but that is just a matter of time on my part. There's always a new PC board to design.

Jean-Yves Trudle VE2BFU is part of a group of students in Quebec who are quite interested in weather applications of radar. He is looking for any inexpensive components to help out on projects. He refers to the column on the 10 GHz amplifier in the September 1992 issue of *73*. He questions, can it be driven from a low power Gunn oscillator? Well, the answer is yes. I use a simple 10 mW Gunn oscillator and 30 dB attenuation on my work bench to replace all other systems in amplifier testing. When used in conjunction with the variable 30 dB waveguide attenuator, it can be preset to some low level to test other devices. I use it to provide power (RF drive) to test traveling wave amplifiers on 10 GHz.

TWTs require about +1 dBm to drive to full amplification of 10 watts output. The Gunn oscillator works very well in this application. It can be used in conjunction with a solid-state amplifier just as well. However, I must stress the output attenuator as it is a must in all applications. Don't ever overdrive amplifiers as it could result in destruction of your test device, depending on the power level used. See Figure 1, my test 10 GHz Gunn oscillator. The only drawback with a Gunn oscillator is frequency instability, but as a power driving source they work exceedingly well and are inexpensive.

A letter from Hugh Duff VE3OYH requests permission to use the amplifier schematic I published in the September 1989 issue of *73* magazine. It concerned an SSB biasing scheme and power amplifier schematic for a 6 meter amp I constructed for my IC-551. The design was not special. It used application notes that were available from transistor manufacturing companies at that time. What I did was try the circuit (class C) and modify it to an SSB class of circuit for linear operation—kind of a class A/B type of operation. In class C no DC power is drawn from the device until driven by RF. In class B's and later class A's, some current is drawn without RF drive to set up the stage towards linear operation.

Also, Hugh is looking for some of the FM accessory boards for the IC-551. Any help out there on the PC boards? Contact Hugh Duff VE3OYH, 136 Baronwood Crt., Brampton, Ontario, Canada L6V-3H8.

Steve Carlisle VE7AHL writes that he has obtained some microwave waveguide material for 10 GHz and would be willing to make some available for interested parties. Steve is located in Port Hardy, B.C., Canada, and can be contacted at (604) 949-8588 (after 6 p.m. PST). The material he has includes 12-foot sections of WG-16 (1/2" by 1" o.d.) and a variety of bends and straight sections. Detector mounts and hybrids are also available. Contact Steve for particulars.

Well, that's it for this month. As always, I will be glad to answer questions regarding this and other related subjects. Please sent an SASE for prompt reply. 73 Chuck WB6IGP

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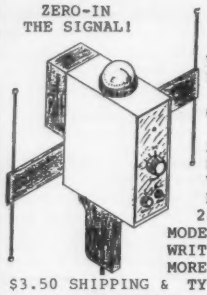

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Notes from FN42

Reward time is here again! What am I talking about? The rewards we receive when we help others become hams. Also rewarding is seeing those we helped become hams last year volunteer to help in this year's classes.

How easy (or hard) is it to host a ham class? I can only speak for myself, but I don't think that it is too hard if one person will provide the coordination and many others get involved and help teach the lessons. What it takes is having the vision to make it happen, letting others know about that vision, and talking it up to those who are active hams.

Luckily, the effort in the Keene, New Hampshire, area really started last year after completing the previous ham class and examinations. All those involved last year said that they wanted to do it again. It was decided to continue to offer the classes once each year. We decided that the classes worked best during the school year, preferably between January and June, so we set a tentative start date in February.

Around December, discussion of the ham classes started to flow on the radio and over coffee. Those of us who helped teach the classes last year asked Doug KD1GJ if he would lead the effort again this year, and he agreed. Off to a good beginning.

January arrives. Meeting time again, this time to decide when to start the sessions and who was going to teach which modules. Before we decided on a date, Doug announced that a new ham club in the area, the Cheshire County DX Amateur Radio Club, was willing to sponsor the effort. It is certainly nice to have the support of a larger group of hams.

The decision was made to offer the classes one evening a week and to go for 10 weeks, with the test in the 11th week. Each class would last for approximately 2-1/2 hours, with a break, and cover three to four modules. Doug, organized as usual, brought the syllabus from last year, and then it was time to select modules to teach. That really took very little time because just about all the modules (with a few exceptions) would be taught by the person who taught it last year.

We are very lucky that one of the largest employers in Keene, Markem Corporation, is also very appreciative of the hams within its organization and is allowing us to hold the classes in its facilities. Markem is also allowing VE testing at the same location four times each year.

February 15th is just several weeks away as I write this column. Lesson plans are being put together by the instructors and hands-on demonstrations are being developed. The old excitement is coming back and starting to bubble to the surface. If you have never felt that excitement, try it, you'll like it!

Well, I'll let you know in the future how things work out, but I bet they will turn out great.

Lastly, I hope that you enjoy the two QSL cards from Japan. There is something about the artistry and colors from Japan that set their pictures and architecture apart from the rest of the world. I am very lucky that David sent two of his QSL cards because one of them is going to stay here on my wall. Now I just have to find him on the air to really deserve it.

Until next month, 73.—Arnie, N1BAC

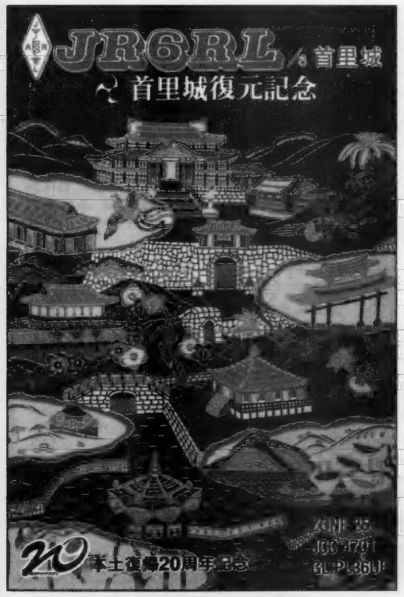

Photo B. QSL card of JR6RL.

Roundup

Pakistan It is with great happiness that the Larkana Amateur and SW Listeners Club celebrated its 2nd anniversary on 6 Nov. 1992.

We invited many people to celebrate with us, including two Canadian hams, Mr. Rod Black and Mr. Mark Naylor, who are now working in Pakistan with a Christian mission. Mr. Black briefly informed the audience about the fantastic hobby of ham radio and donated some books to our club. After the program was over, 20 interested people filled out the membership forms of the club. We have about 50 books about electronics and amateur radio in our library.

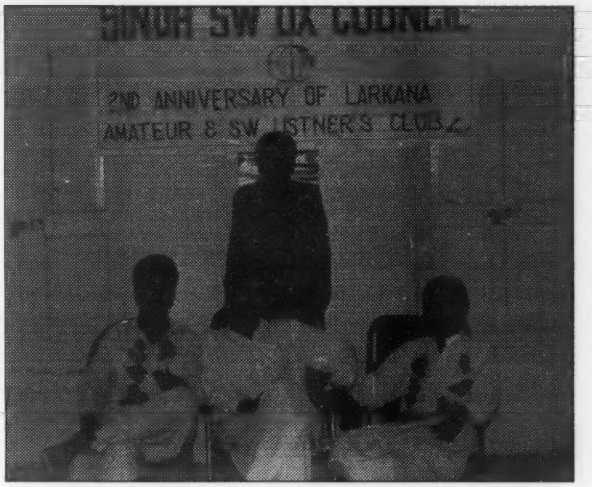

Photo A. A few members of the Larkana Amateur & SW Listeners Club.

Our radio equipment presently consists of a Drake TRM-34 (100 watts) SSB Marine transceiver that operates on the 2, 4, and 8 MHz bands. Does anyone know if this radio can be converted to the ham bands, or would anyone like to exchange this radio for an SSB QRP transceiver? The radio would have to have the 20 meter band. We also have a vintage Radio Holland Type BC 348JW communication receiver with frequency coverage of 200 kHz to 18 MHz in six bands. We are interested in trading this radio as well for an SSB QRP radio. As you can see, we have no radios to get on the air because of the great expense, so we would definitely appreciate anything that you might have that you could donate to us or trade with us.

Please communicate with us at this address: Arshad H. Quadri (AP2AHQ), Larkana Amateur & SW Listeners Club, No 1989/A 1, Shaikh Street, Karma Bagh Larkana, 77150, (Sindh) Pakistan.

Russia *Downloaded from packet, initiated by Sandy Lynch WA6BXH:* The following message was recently received here from Andy RW3AH/WL7AP. I think he and Ed NT2X wrote it together; the info may be of interest to others. 73 de Sandy WA6BXH/7J1ABV [WA6BXH @ NØARY].

Ham Radio in CIS Becoming Expen$ive There are serious troubles looming on the horizon for the amateurs of the former USSR. Obsessed with "market economy," people in charge of Amateur Radio Service on the government level have imposed (or will impose very soon) substantial fees for the privilege of operating on the air.

The First Class license (equivalent of the US Extra) will cost a ham 120 rubles per annum. To enter any contests, one would fork over 240 rubles per year, in addition to the above. It won't matter if you run 100 watts or 10

Photo C. The beautiful QSL card of 7J6CBQ, David Cowhig, Hambassador to Okinawa, Japan.

kW. Special calls call for yet more money. In US currency this doesn't look like much ($1 = 500 rubles), but it sets a dangerous pattern—pay for what once was free, and expect an increase anytime. The opinions of ham ops were never requested, it seems.

In addition, getting a contest certificate via the bureau would cost five rubles, receiving a single card via the bureau now costs 50 kopecks, sending a single card abroad via the bureau would cost two rubles 15 kopecks. An airmail letter from Russia to anywhere in the world now costs 75 rubles.

Since the prevailing majority of hams can't afford to send airmail letters (the average salary now stands at three to four thousands rubles per month) in quantity, and because the foreign mail isn't getting through to Russia, those U-cards will become very rare indeed very soon. Moscow hams report piles upon piles of incoming QSLs at Box 88 that don't and won't get processed. The bureau is broke and can't pay its employees or its own mailing expenses. Again, hold onto your CIS cards, don't mail them over there until the situation is resolved.

On the related subject: January 1993 was set as a time frame for the changeover of current amateur callsign allocations to a new system. Ninety-five percent of all Ukrainian calls will change as well as a substantial amount of Russian calls, if the new system is implemented. Other republics will see a full 100% change of existing calls. As was announced earlier, the new allocations were assigned without any consultations with hams, thus the amateur community of the former USSR republics is in a state of turmoil. Nobody knows what will take place, when and how.

Letters were sent to the ITU, trying to stop the new assignment; government offices responsible for communications were petitioned without any obvious results. There is talk about having hams retain the present callsign system, while commercial and utility calls would be converted. At this time, it is all pure speculation and no decisions on this explosive topic were rendered. There would be no special calls assigned within the CIS for 1993, I was told, pending the outcome of the above.

As always, we will provide more details as they become available.

73 de Andy RW3AH/WL7AP, 19 Jan. 1993, RW3AH @ RK3KP.#MSK.RUS.EU

Switzerland *From the International Telecommunication Union (ITU) Press:* The ITU has issued the first series of telecommunication indicators covering all republics of the former Soviet Union: Commonwealth of Independent States (CIS), the Baltic States, and the Republic of Georgia.

A joint collaboration of the ITU's Telecommunications Development Bureau and the OECD Centre for Co-Operation with the European Economies in Transition, Telecommunication Indicators of the Former Soviet Union highlights the current state of telecommunications in the region. It has over 30 tables and charts and includes regional totals and averages.

An analysis of the data shows that the telecommunication sector has been characterized by under-investment over a long period, resulting in an urgent need for network modernization to meet the requirements of the population and the emerging market economies.

The supply of telecommunication services also varies greatly from one republic to another, with an average of main telephone lines per 100 inhabitants for the former Soviet Union of 14 (Baltic states average over 20, the Central Asian republics less than 10, and Belarus, Ukraine, and the Russian Federation close to the average).

Highlights of the statistical compilations include: an official waiting list of over 18 million lines (about half the number of existing subscribers, which probably underestimates the total demand); automatic local networks but with low levels of digitization and old exchanges; an estimated investment of US$90 billion to attain a telephone density of 30 main lines per 100 inhabitants by the year 2005, requiring the installation of 60 million main lines; an average level of telecommunications development about the same as Central and Eastern Europe and similar to the situation in Western Europe in the 1970s.

The data is available both in hard copy and diskette formats with STARS (Socioeconomic Time Series Access and Retrieval System)—a user-friendly retrieval software for use with microcomputers. For more information and permission to reproduce any part of the publication, please contact: Mr. Michael Minges, Information Services/Telecommunications Development Bureau, International Telecommunication Union, Place des Nations, CH-1211 Geneva 20, Switzerland. Telephone: +41 22 730 5519; FAX: +41 22 730 5484.

OKINAWA—JAPAN

David Cowhig 7J6CBQ/WA1LBP
AmCon Naha
FBU PSC 556, Box 840
FPO AP 96372-0840

Thanks to *73 Magazine* for appointing me Hambassador to Okinawa, Japan. I am unworthy. The true hambassador to Japan is Ambas-

sador Armin Meyer W3ACE, who served as US ambassador to Japan 1970-1973. Ambassador Meyer told me once that his security guards were very alarmed one day in the early '70s in Tokyo when his car was rushed by a group of Japanese men. When they got close to the car the men began waving their QSL cards at Ambassador Meyer! Perhaps it was Ambassador Meyer's high-level ham enthusiasm that inspired the Japan-US reciprocal licensing agreement which came a few years later.

December in Okinawa, as in the rest of Japan, brings forget-the-old-year parties (bonenkai) for office workers and hams alike. During December I went to bonenkais of the southern Okinawa 145.19 MHz foxhunting group and of the the central Okinawa 2 meter FM group. A week later Yamamoto-san JS6HGV of the foxhunting group took me on a two-hour foxhunt all over Urasoe City, ending with an impromptu meeting over coffee and cakes under the stars. Lots of fun even though Yamamoto-san and I were the last ones to find the fox!

Okinawa blended the cultures of south Asia, China and Japan to create its own unique culture. Awamori, a powerful Okinawan drink made famous by the Japanese actor Marlon Brando in "Teahouse of the August Moon," was brought back to Okinawa 500 years ago from Thailand by Ryukyu Kingdom sailors. Okinawan music and dance, which are quite distinct in beat and style from that of the rest of Japan, owes much to the instruments and music of Indonesia and India. After World War II the United States had some influence on Okinawa, introducing universal education, the first university (Ryukyu University) and root beer. Their very cosmopolitan history has made the Okinawans the friendliest and most internationally minded of all the Japanese. The Okinawans sum up their attitude in the Okinawan dialect phrase "ichariba chode," which can be translated as "aloha" or as "to be brothers from the first meeting."

A new historical novel about the 17th century Ryukyu Kingdom, *The Winds of the Ryukyus*, by Chin Shunshin, now an NHK TV series, has stimulated a tremendous revival of interest in Okinawan history and culture. Chinese goods acquired in exchanges with Ming China through the Ryukyu Kingdom tribute missions and Chinese embassies to the Ryukyu Kingdom capital at Shuri were used to trade throughout South Asia and Japan. Okinawans had a practical monopoly on the China trade since Ming China traded directly only with its loyal tributary state in Okinawa and Chinese merchants were forbidden to travel abroad. My QSL card, which I am able to use thanks to the kind permission of the Urasoe City Museum of Art, shows tribute ships which carried Okinawan presents to the Ming Emperor.

On April 1, 1993, a new Japanese law charges user fees to all users of the radio spectrum. This is on top of the current fees which radio stations pay today. For example, my 50-watt fixed/mobile ham license costs about $30 per year to renew. Even my 50 watts is high—most Japanese hams have third- or fourth-class licenses and run 10-25 watts. The initial license fee and renewal fee is on a sliding scale which increases with transmitter power output. Japanese hams will pay 500 yen (US $4), while radio broadcasters will pay 29,700 yen ($300) annually. This new Japanese law is intended to raise money to regulate licensed stations and to detect and close down unlawful radio stations. In 1990 there were an estimated seven million lawful radio stations and 1.2 million illegal radio stations operating in Japan. Another goal is to boost radio spectrum use efficiency.

Similar efforts to boost spectrum efficiency by user fees and other methods are also being considered by the US National Telecommunications and Information Administration (NTIA) and the US Congress. NTIA administrator Janice Obuchowski has compared the sale of radio spectrum in order to improve spectrum utilization efficiency to the transfer of public grazing lands to private ownership in 17th and 18th century England, which economists credit with greatly boosting agricultural productivity. Today (January 3) Song BY5HZ, in Hangzhou, China, told me that the Chinese government has decided to allow Chinese hams to set up ham stations in their own homes. Song, a junior high school teacher, has held his own personal callsign BG5FA for about a year but beginning February 20, 1993, he will be allowed to operate a home station. Song told me that some of the first Chinese hams, such as BA1CY in Beijing, have been allowed to operate from a private home for about a year. Now this privilege is being extended to more recent licensees, such as Song. This is wonderful news for Chinese ham radio operators and for hams around the world. Perhaps many of the Chinese hams who couldn't get on the air after graduating from school will return to the air.

A reminder to all who wish to get a license when coming to Japan: The best way to get information is to write to the JARL International Section, 14-2 Sugamo 1-Chrome Toshima-Ku, Tokyo 170 Japan.

(David's contribution will be continued next month.—Arnie)

NEVER SAY DIE

Continued from page 66

heard of the ham *CQ* or *Communications Quarterly.*

When I took over as editor of *CQ,* back in 1955, the magazine was in bad shape. It was losing several thousand dollars a month, which was a lot of money in those days. It was being kept alive by *Radio-Television Service Dealer,* a sister publication. I didn't come into the job cold. I'd been publishing *Amateur Radio Frontiers* for four years. This meant I'd been getting articles, editing them, drawing the schematics myself, taking the photos, writing my usual long editorials, typing the finished copy, selling the advertising, soliciting subscribers, doing the bookkeeping, mailing the copies, and so on, all in my spare time. My main job at the time was manufacturing and selling loudspeaker enclosures.

Add to this my years of building ham and RTTY equipment, converting surplus, pioneering 6m (I was the first one in NYC on the band and ran a beacon station for several years), pioneering NBFM, working tons of DX, having a basement packed solid with equipment and parts, having already been active in just about every contest there was, having built my first SSB rig, (with W2BFD) helping set up one of the first repeaters, etc. When I get interested in something I tend to go overboard.

My *Frontiers* publication was mainly about RTTY and helped our group cooperate to override the endless battles the ARRL put up trying to stop RTTY from being permitted on the HF bands. It took several years, but we finally beat the League.

Thus, when I took over the helm at *CQ* I had already been deeply involved in amateur radio for about 18 years. I walked away from a million-dollar speaker business to work for $10,000 a year editing a ham magazine. Well, the other was by this time just a business and this was fun. I'd started the speaker business with $1,000 borrowed on my car and built it into the largest manufacturer of speaker enclosures in the country. I needed a fresh challenge.

Within six months I had *CQ* into the black and four years later it was turning in a profit of over a million in today's dollarettes. It was the biggest money-maker in the history of Cowan Publishing. During the five years (to the day) I was editor I had a ball. There was that DXpedition to Navassa (KC4AF), where we almost got killed a couple times. There was Operation World Wide, where I flew around the world operating from a MATS (Military Air Transport System) plane, making 20m SSB contacts as we visited 25 countries. Then I represented the US amateurs at the WARC meeting in Geneva. I'll have to tell you about those days some time.

I was having so much fun that I stayed on as editor a couple years longer than I should have. But I've written about all that befo . . . and no doubt will again. I'll be writing about my early fun in *Radio Fun.*

Speaking In Tongues
Where Has English Gone?

We hams can't help making fun of CB jargon . . . right, good buddy? Yet we've got our own private language and we immediately recognize a newcomer who isn't fluent in our Q-signal shorthand. It's always seemed odd to me when hams use Q-signals on voice. They were invented to try and mercifully speed up our pathetically slow CW contacts . . . or QSOs, as you probably call them.

When I got involved with computers I had to learn a whole new language. I found that most computer folk had little residual fluency in plain English and thus were no longer able to interface with ordinary people.

Lawyers have their own language, if you've ever read any legal papers. Politicians have theirs. It's interesting trying to translate the weird language of our laws into something the rest of us can understand. And I wish I'd had a tape recorder along on an around-the-world flight on a Military Air Transport Service plane, just to capture the fascinating language of the PR officer who accompanied us.

I read a lot of magazines, so I have to be able to interpret computerese, legalese, governmentese, medicalese, hamese, hi-fi-ese, and educationese. It's a challenge to try and figure out what some professor is trying to say. For instance, in the latest *Kappan,* professor Dempster writes, "Research has shown that, under certain conditions, practice may either reduce the effects of interference or result in proactive or retroactive facilitation of learning." What did he say? And he goes on for five pages of this gobbledegook, plus a half page of references.

Several years ago it seemed to me that businessmen might like to have a way to learn about computers without having to learn computerese. So I started a new magazine, *Desktop Computing.* It was a tussle getting the writers to stick to English, and even more difficult to find editors capable of translating computerese into English. But we did it and the readers loved the publication. Alas, when I sold my publishing company in 1983, I had no way to continue doing the magazine, so I sold it along with all the others. The new publisher, being totally involved with computers, quickly killed it off.

For my part, when I'm on the air I avoid jargon and stick to plain English. I have problems with interference, not QRM. I go to bed instead of modulating the mattress. I answer the phone instead of the landline. But then I am very resistant to talking about my transceiver and antenna, much preferring to talk about what the other chap does, what else he's interested in, what he likes about where he lives and so on. You probably wouldn't like it at all. 73

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NEW PRODUCTS

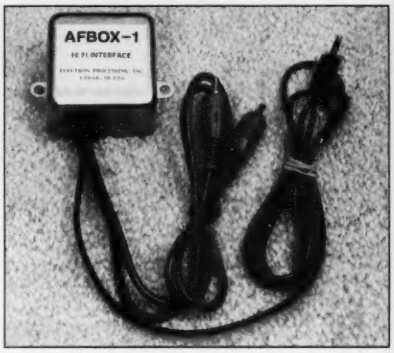
Compiled by Hope Currier

NCG/COMET

COMET Antenna has introduced the newest addition to their extensive line of multiband antennas, the CH-32 "Miracle Baby" Mini HT Antenna for 2m/70 cm. The CH-32 has surprising performance, is only 1.75 inches tall, and has a black matte finish and a BNC connector. It is designed with a pivoting head, absorbing shock and protecting the radio's connector from damage. The CH-32 meets the modern operator's need for a small, compact antenna that easily works the nearby repeater systems and is useful for communicating at hamfests, on Field Day, while doing tower work, etc. Its small size makes it inconspicuous and proportionate in size to the newest HT transceivers.

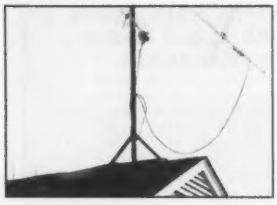
For the price and more information, contact *NCG, 1275 North Grove St., Anaheim CA 92806; (714) 630-4541, (800) 962-2611, Fax: (714) 630-7024.* Or circle Reader Service No. 201.

ELECTRON PROCESSING



Electron Processing has announced a device to greatly improve scanner and shortwave reception. The AFBOX-1 allows you to connect your receiver to an existing hi-fi stereo system to extract the best fidelity and clearest sound obtainable from your scanner or shortwave receiver. By connecting to a stereo system scanner, listeners can often understand previously unintelligible background conversations. Shortwave listeners can finally enjoy the full fidelity with which the broadcasts were meant to be heard. Connection to the external speaker jack of the receiver and the hi-fi auxiliary input jacks is easy with the supplied connectors. An isolation transformer and passive attenuator assure clean, noise- and hum-free sound on both right and left channels. The AFBOX-1 can be connected to a VCR for up to six hours of quality recording.

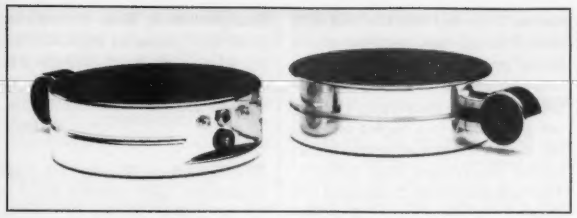
The AFBOX-1 is $30 plus $5 S & H. For more information, contact *Electron Processing, Inc., P.O. Box 68, Cedar MI 49621; (616) 228-7020.* Or circle Reader Service No. 205.



G & P ENGINEERING

G & P Engineering has announced a new style of antenna mounting system called the "N-PAM" unit. The N-PAM unit will mount on the roof without drilling holes into the roof. It will mount on any roof at any pitch from flat to a 12/12 pitch, and will allow use on roofs with 16" o.c., 24" o.c., stick-built or truss systems. Basic systems include single or dual tray units with a 2" mast 3' high—ideal for a tribander/VHF-UHF system. Options include a 5' or 7' mast. The 7' mast can be used with the largest OSCAR antenna system or stacked yagis.

All mounts are made of steel and are primed and painted with a durable and hard epoxy paint, black, to blend with most roof shingle colors. For prices and more information, contact *G & P Engineering, 4943 Finch Court, Stephens City VA 22655; (703) 869-4530, Fax: (703) 869-5116.* Or circle Reader Service No. 204.



CAL-AV LABS

CAL-AV Labs, Inc. has introduced the Spirit™ series of dual-paddle Morse keys, which incorporate advanced design and a new technology to eliminate contacts and all other moving parts. Designed for optimum performance in a traditional operating environment, the Spirit provides familiar functionality very similiar to a mechanical key. Its solid-state-force sensors activate when a given, preset force is exceeded. Independent left and right adjustments have infinite resolution, and will accomodate operators with a light or heavy touch. The unit weighs five pounds and will not move from its desired desktop location.

The Spirit is currently available as a limited-production edition for the discerning enthusiast. Its uncompromising quality is evident in its polished, solid brass construction. Each key is individually serialized and can be further customized to a user's preferences: engraving of an individual's name or call letters is available; chrome or gold plating are optional. Detachable cabling accomodates a wide variety of keyers. Prices start at $380. For more information, contact *CAL-AV Labs, Inc., 515-B Westchester Drive, Campbell CA 95008; (408) 369-1000.* Or circle Reader Service No. 203.

LARSEN ANTENNAS

Larsen Electronics' new KG 1290 is the first on-glass antenna for amateur application on the 1290 MHz band. Engineered for ham use in North America and Japan, the unit covers the bandwidth from 1235 to 1432 MHz with a VSWR reading below 1.5 to 1. Using a collinear design featuring a 1/2 wave over 1/4 wave, the antenna produces 3 dBd gain. Exceptional performance stems from the patented Kulglass design that places the radiating antenna circuitry in the outside coupler (not inside the vehicle) to maximize efficiency. Model KG 1290 also features a Kulrod copper-plated whip which lets transmit power become signal, not heat resistance.

The suggested retail price is $59.95. For more information, contact *Larsen Antennas, Larsen Electronics, Inc., 3611 N.E. 112th Avenue, P.O. Box 1799, Vancouver WA 98668; (206) 944-7551, Fax: (206) 944-7556.* Or circle Reader Service No. 202.

OAK HILLS RESEARCH

The QRP Spirit Transceiver from Oak Hills Research is a single-band kit offered for 80, 40, 30, 20 or 15 meters. It includes an iambic keyer using the latest Curtis Keyer Chip 8044ABM, a Superhet receiver design with a diode ring mixer and an RF preamp, a 4-pole crystal ladder filter followed by an on-board audio filter, and a switchable HP AGC circuit with manual RF gain control. It also offers 2 watts of audio output with an external speaker jack, VFO tuning with an 8:1 vernier dial covering 100 kHz and RIT, and a sine wave oscillator with frequency and level controls. The kit measures 4" x 6-1/4" x 6-7/8" and weighs 47 oz.

This kit comes complete including the cabinet, all components and instructions. All coils are pre-wound. The price is $198.95. For more information, contact *Oak Hills Research, 20879 Madison St., Big Rapids MI 49307; (616) 796-0920, (800) 842-3748, Fax: (616) 796-6633.* Or circle Reader Service No. 206.

BARTER & BUY

Turn your old ham and computer gear into cash now. Sure, you can wait for a hamfest to try and dump it, but you know you'll get a far more realistic price if you have it out where 100,000 active ham potential buyers can see it than the few hundred local hams who come by a flea market table. Check your attic, garage, cellar and closet shelves and get cash for your ham and computer gear before it's too old to sell. You know you're not going to use it again, so why leave it for your widow to throw out? That stuff isn't getting any younger!

The 73 Flea Market, Barter 'n' Buy, costs you peanuts (almost)—comes to 35 cents a word for individual (noncommercial) ads and $1.00 a word for commercial ads. Don't plan on telling a long story. Use abbreviations, cram it in. But be honest. There are plenty of hams who love to fix things, so if it doesn't work, say so.

Make your list, count the words, including your call, address and phone number. Include a check or your credit card number and expiration. If you're placing a commercial ad, include an additional phone number, separate from your ad.

This is a monthly magazine, not a daily newspaper, so figure a couple months before the action starts; then be prepared. If you get too many calls, you priced it low. If you don't get many calls, too high.

So get busy. Blow the dust off, check everything out, make sure it still works right and maybe you can help make a ham sure it still works right and maybe you can help make a ham newcomer or retired old timer happy with that rig you're not using now. Or you might get busy on your computer and put together a list of small gear/parts to send to those interested?

Send your ads and payment to the Barter 'n' Buy, Judy Walker, 70 Rt. 202N, Peterborough NH 03458 and get set for the phone calls.

The deadline for the May classified ad section is March 11, 1993.

SUPERFAST MORSE CODE SUPEREASY. Subliminal cassette. $10. LEARN MORSE CODE IN 1 HOUR. Amazing supereasy technique. $10. Both $17. Moneyback guarantee. Free catalog: SASE. Bahr, 150 Greenfield, Bloomingdale IL 60108. BNB221

WANTED: YAESU FTV-250 2M TRANSVERTER. Ken Kaletta N9NST, 1012 Pape Ave., Ft. Wayne IN 46808. (219)426-2633. BNB250

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MOST complete and comprehensive-resistor color code identification chart-coil winding data chart-L, C, F nomagraph- capacitor decipher chart. Stop mystery of componet identification. Post charts at work bench for quick component identification. Specify required chart, each chart $3.00 all for $10.00. Send payment to **TMS ELECTRO-DATA INC.,** 4906 S.E. Mills, Lawton OK 73501. BNB255

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Uncle Wayne's Bookshelf

REFERENCE

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RANDOM OUTPUT

David Cassidy N1GPH

Is This Frequency In Use?

Is it me, or are people getting stupid? Allow me to relate to you what I experienced last weekend. The names and callsigns have been changed to protect the moronic.

I had been involved in a net on 7.283 MHz for close to an hour. It was a cold, gray Saturday morning, and I was enjoying the net and a second cup of coffee. We had check-ins from locations as far apart as Colorado, Georgia and Nova Scotia. Net control was located in Milwaukee, and he was running slightly more than 900 watts. Conditions on 40 meters were excellent and the band was packed.

A W1 station came on our exact frequency, and without a word of warning started calling a W2 station. His signal was S-9 +20 and just about wiped out the entire Northeast part of the country. I informed him that the frequency was in use, and asked him kindly to move. He never acknowledged that he heard me (knowing his location and my antenna's performance, I am 100% certain that he did).

After a minute or two, he made the same call, and I again asked him to move. Again, no reply. Two or three minutes later, the same scenario. By this time, stations in New York and Nova Scotia had also asked the W1 to move. They were met with the same results I had achieved—silence.

Another five minutes passed without a call. Right at the top of the hour, the W1 came on and started informally calling a net ("Anybody from the XYZ net on frequency?"). The W2 station he had originally called came back to him and they started an informal chat. At the first available break in their seemingly endless discussion about their signal strengths, I keyed up and again informed them that the frequency was in use by another net, and would they please move off frequency.

Now, here comes the really incredible part.

W1: Did you hear that?

W2: Yup, I heard something. I think he said there was another net on this frequency.

W1: Yeah, that's what I heard.

W2: If we move frequencies, the net will never find us. This is our frequency. We've been here for years. They must be a new net (the net I was checked into has been operating for many years at the same time and frequency, though I can't fathom what that has to do with anything).

W1: So, how's my signal now? I just changed over to the other antenna.

The two stations, after acknowledging that they had heard me and that they were aware that another QSO was in progress on the frequency, continued their conversation as if nothing had happened. I couldn't believe it! I again asked them to move, and again they acknowledged that they heard me—with the same results. I heard net control call me for my next transmission, but was wiped off of the net by these two lids. They finally said, "let's move up 500 hertz, to give them a little room." Can you believe it? These weren't a couple of newcomers. Judging from their callsigns, these two lids had each been hams for over 25 years, and yet they thought that moving 500 hertz would do anything? Did these guys know the first thing about radio?

Every area of human endeavor has a set of fundamental rules, guidelines or mutual agreements. All participants in the activity have agreed to abide by these rules. When you drive an automobile, you agree to be sober and to obey certain traffic signals. In this country, you agree to drive on the right side of the road. One of the fundamental agreements that we amateurs make with each other is that we will ask if a frequency is in use before transmitting. We have also agreed that no station or group of stations can lay claim to a particular frequency. This means that there will often be conflicts. When propagation on a particular band shifts, two QSOs could end up on the same frequency. Mature adults should be able to quickly comprehend what is happening, and resolve the dilemma by one of the parties offering to find another frequency (it's amazing how often I've heard 30-minute name-calling sessions as a result of shifting band conditions). When it's time for your net to start, and the frequency you've met on for 20 years is occupied, you should either move, ask the occupants of the frequency to move, or maybe even ask the occupants for a few seconds to inform your net members to stand by and wait.

There are numerous ways to accomplish this basic agreement among all radio amateurs, but we must start from a position of mutual respect and common courtesy. We are not dealing with brain surgery here. Nobody dies if you don't get to hold your net or scheduled contact on a particular frequency at a particular time. Yet, I've often heard suggestions of physically impossible acts and threats of physical violence exchanged between two adults, simply because 10 meters shifted and they found themselves on the same frequency. What *is* the matter with us? 73

PROPAGATION

Jim Gray W1XU

Jim Gray W1XU
210 East Chateau Circle
Payson AZ 85541

April's conditions for the upper HF bands appears somewhat "iffy" with many Poor (P) and Fair (F) days in the forecast. It appears that the poorest conditions will be during the first and last days of the month, while the in-between days will range from Fair (F) to Good (G). The best days are likely to center around the 12th and the 22nd, and several days on either side of these dates. The full moon occurs on April 6th.

Use the daily chart to find the best days for your efforts and choose the Band-Time-Country chart to discover when and where to operate. Trends are indicated by hyphenated letters such as F-G meaning Fair-to-Good conditions expected, or P-VP meaning Poor-to-Very-Poor conditions are expected. Remember, however, that these forecasts are not cast in concrete, and that unexpected bonus days or terrible days may occur at almost any time. We're trying to "play percentages" here, so be on the lookout for sudden opportunities. Your best source for *trends* is WWV at 18 minutes after each hour (I use the 10 MHz signal as the most reliable copy from Arizona). They will tell you the status of the earth's magnetic field and the energy output of the sun during a 24-hour period. The sun's radio energy is measured at a wavelength of 10 cm, which seems to have a good correlation with actual propagation conditions on the HF bands.

April is historically a good month for communication and you can expect DX to the east in early morning hours, short skip during the day, and DX to the west in afternoon hours. The higher the band, the sooner it closes toward evening hours. 20 meters should stay open on Fair or Good days until after dark, while the 10, 12, 15 and 17 meter bands will close around sunset. You may try some DX on 30 meters in the mid-to-late afternoon, lasting until well after dark, although as I write this column, the 30 meter band seems to close soon after dark. 40, 80, and 160 meters are usually quite active into the "wee" hours of the morning, so if you are a "night owl" enjoy the opportunities that abound around 1-5 a.m. local time. During the active spring storm season there will be heavy QRN on many days . . . but these storms usually subside after 10 p.m. local time as the solar energy that feeds the storms abates. Solar activity (flux) is dropping to the 100 level as I write, which means that ionization is not as great and does not last as long as a few months ago. Inasmuch as solar flux correlates with DX "conditions" and with the sunspot numbers, it is apparent that we are well on our way to the bottom of Cycle 22. During the DX heyday a few years ago, solar flux values of 200-300 were common.

Choose your days carefully from the chart, and correlate "conditions" with the Time-Band-Country/Area chart for the most likely success. As "conditions" deteriorate, you will need more power than usual to "get through," as well as better antennas. 73

EASTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	15	20	–	–	–	–	20	20	–	–	–	15
ARGENTINA	20	40	40	40	–	–	20	15	15	10	10	15
AUSTRALIA	15	20	20	–	40	40	40	–	–	20	20	15
CANAL ZONE	20	20	20	20	20	20	20	15	10	10	15	15
ENGLAND	40	40	40*	40*	–	20	15	10	15	20	20	–
HAWAII	15	20	–	–	–	–	20	20	20	10	10	15
INDIA	–	–	–	–	–	–	20	20	–	–	–	–
JAPAN	15	20	–	–	–	–	20	20	–	–	–	15
MEXICO	20	20	20	20	20	20	20	15	10	10	15	15
PHILIPPINES	–	–	–	–	–	–	20	20	–	–	–	–
PUERTO RICO	20	20	20	20	20	20	20	15	10	10	15	15
SOUTH AFRICA	20	40*	–	–	–	–	20	10	10	10	15	20
U.S.S.R.	–	–	–	–	–	–	20	15	20	20	–	–
WEST COAST	15/20	20/40	80	160	160	160	–	–	–	10	10	15

CENTRAL UNITED STATES TO:

ALASKA	15	–	–	–	–	–	20	–	–	–	–	15
ARGENTINA	20	20	20	40	40	–	20	20	15	10	15	15
AUSTRALIA	15	20	20	–	–	–	40	–	–	–	15	10
CANAL ZONE	15	20	40	40*	40*	–	20	15	10	10	10	15
ENGLAND	40	40	80	–	–	–	–	20	15	15	20	40
HAWAII	15	20	–	40	40	40*	40*	20	20	15	10	15
INDIA	–	–	–	–	–	–	–	20	–	–	–	–
JAPAN	15	–	–	–	–	–	–	20	–	–	–	15
MEXICO	15	20	40	40*	40*	–	20	15	10	10	10	15
PHILIPPINES	15	20	–	–	–	–	–	20	–	–	–	15
PUERTO RICO	15	20	40	40*	40*	–	20	15	10	10	10	15
SOUTH AFRICA	20	40	–	–	–	–	–	15	10	10	15	20
U.S.S.R.	–	–	–	–	–	–	–	20	15	20	–	–

WESTERN UNITED STATES TO:

ALASKA	10	15	20	–	–	–	40	40	40	–	–	20
ARGENTINA	15	20	–	40	40	–	–	20	–	10	10	15
AUSTRALIA	10	15	20	20	–	–	40*	40*	20	20	15	15
CANAL ZONE	15	20	20	–	–	–	–	20	15	10	10	10
ENGLAND	20	40	40	–	–	–	–	–	15	15	20	20
HAWAII	10	15	20	40	40	40	–	20	20	15	15	10
INDIA	–	15	20	–	–	–	–	–	20	–	–	–
JAPAN	10	15	20	–	–	–	40	40	40	–	–	20
MEXICO	15	20	20	–	–	–	–	20	15	10	10	10
PHILIPPINES	10	15/20	15/20	–	–	40	40	40	–	20	–	20
PUERTO RICO	15	20	20	–	–	–	40	40	40	–	–	20
SOUTH AFRICA	20	20	–	–	–	–	–	–	15	10	15	15
U.S.S.R.	–	–	–	–	–	–	–	–	20	20	–	–
EAST COAST	15/20	20/40	80	160	160	160	–	–	–	10	10	15

*Try 80 meters.

The bands shown represent the highest usable a these times on "Good Days."

Note that the lower frequency bands open first and close last.

APRIL 1993

SUN	MON	TUE	WED	THU	FRI	SAT
				1 P	2 P	3 P-F
4 F-P	5 P	6 P	7 P-F	8 F	9 F-G	10 G
11 G	12 G	13 G	14 G-F	15 F-P	16 P-F	17 F
18 F-G	19 F-G	20 F-G	21 G	22 G	23 G	24 G-F
25 F-P	26 P	27 P-VP	28 P-VP	30 P	31 P	

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HF TRANSCEIVER

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